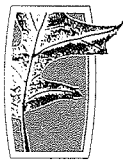

THE FORRESTER GROUP

INSIGHTFUL ENVIRONMENTAL SOLUTIONS™

SOIL-GAS SITE INSPECTION REPORT

Union Pacific Railroad
Phoenix Rail Yard
Phoenix, Arizona

Prepared for

UNION PACIFIC RAILROAD
Environmental Management Group
Omaha, Nebraska

Prepared by

THE FORRESTER GROUP
5460 Ward Road, Suite 110
Arvada, Colorado 80002
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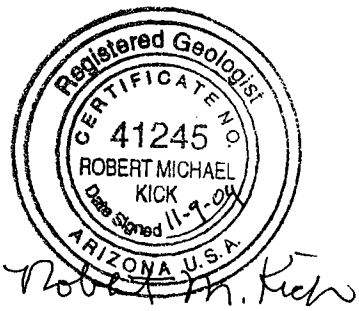

CONTENTS

1 INTRODUCTION / BACKGROUND

This investigation report details the sampling methods and sampling results from a soil-gas survey conducted between June 8, 2004 and June 29, 2004 at the former Southern Pacific Phoenix Rail Yard Site ("Site") in Phoenix, Arizona (Appendix A, Figure 1). The rail yard, located at 1301 East Harrison Street (Figure 2), is owned and operated by Union Pacific Railroad ("UPRR").

1.1 PURPOSE

This investigation and assessment was performed voluntarily by UPRR under the oversight of the United States Environmental Protection Agency ("EPA") as part of its ongoing investigation in the area of Operable Unit 3 ("OU3") in the Motorola 52nd Street NPL site. The purpose of the soil-gas survey conducted on UPRR property was to determine if there was evidence of chlorinated hydrocarbon impact at the site. Additionally, if an impact was found, the soil-gas survey was to determine if a connection existed between the impact(s) found and the Motorola plume.

1.2 INVESTIGATION PLANS

The "Final Site Inspection Work Plan" (Forrester 2004C) was finalized from the draft version (Forrester 2004A), based on written and verbal comments from EPA, Shaw Environmental ("Shaw" – consultant to EPA), and the Arizona Department of Environmental Quality ("ADEQ"). Field sampling methods are outlined in the "Final Field Sampling Plan" (Forrester 2004E) Quality assurance issues were outlined in the "Draft Quality Assurance Project Plan" (Forrester 2004D). Health and safety issues are outlined in the "Health and Safety Plan" (Forrester 2004B).

2 SOIL-GAS INVESTIGATION

Between June 8 and June 17, 2004, soil-gas samples were collected at 84 locations throughout the Site. All of these locations had been reviewed by EPA and Shaw during a site visit on April 27, 2004. An additional 19 locations were sampled between June 28 and June 29, 2004. Sample results are shown on Figure 3.

2.1 DRILLING AND SAMPLING METHOD

A direct-push rig provided by Johnson Environmental Technologies, using push rods with an approximate diameter of 1.5 inches, was used to collect all soil-gas samples (Appendix B, Photo 1). In many locations, very hard caliche, hard large cobbles, or concrete were encountered within three feet of the surface. In these cases, a solid drive tip was used first. If that failed, a pneumatic drill with a half-inch diameter, two-foot long drill concrete drill bit was used. If that failed, a 1.5-inch diameter concrete hole saw with 1.5-foot length shaft was attached to the pneumatic drill and used to drill a hole through the obstruction. If this failed, the hole was abandoned and another location was selected within a few feet of the first.

After breaking through the hard surface layer, the vapor probe tip was installed at the end of the push rods and pushed to the target depth of 10 feet below grade. Of the 103 sample locations, 89 of them were sampled at the 10-foot depth. The most shallow sample was at seven feet. To comply with a request by ADEQ to collect the sample from location SG-81 as deep as possible down to 15 feet, the sample from this location was taken at 12.5 feet, which was the depth of drilling refusal.

Once at total depth, the push rods were pulled up a few inches exposing the 3-inch long vapor probe tip to the subsurface (Appendix B, Photo 2). The tip was sealed off from the push rods by O-rings. At the surface, hydrated bentonite was placed around the exposed push rod in the annular space between the surface and the push rod to provide a surface seal (Photo 3). A cloth saturated with 1,1-difluorohexane (Staples® brand air duster) was placed over the bentonite seal to act as a leak check compound (Photo 4).

Teflon™ tubing (quarter inch in diameter), that had been attached to the vapor probe prior to drilling, extended up the length of the push rods and emerged from the top of the rods approximately three feet.

For most of the locations, a relatively large volume of soil gas was purged (10 liters) to allow each location to have a large radius of influence. The large radius would help ensure that an area of significant impact of chlorinated hydrocarbons, that did not happen to be directly in contact with the vapor probe, would be detected. The following procedures were used to collect the soil-gas samples:

- The end of the tubing was attached to a series of valves which were connected to a flow meter and finally to an electric air pump (Photos 5 and 6). The sample stream was shielded with an umbrella so that sunlight did not directly contact the sample tubing, valves, or sample syringe during the purging or sampling processes. The pump was turned on and the flow meter was adjusted to 500 mL/minute.

- During the purging time of 10 minutes, the vacuum on the air pump was recorded periodically. In 101 of the 103 locations, the vacuum was zero indicating good vapor flow in the subsurface (an elevated vacuum would indicate poor air flow). At the same time vacuum readings were recorded, the vapor effluent on the air pump was tested with a photo ionization detector (PID). Since the PID was calibrated on a daily basis with isobutylene, the readings on the PID were not direct measurements of chlorinated hydrocarbon concentration in the soil-gas. However, they were used to help determine locations where to collect duplicate samples. Data collected during purging is presented on Table 1, Appendix C.

- After purging, the air pump was turned off. A new labeled plastic 60 mL syringe was attached to one of the valves. The valve was turned to allow soil gas to be drawn into the syringe. The syringe was filled at a rate of approximately 60 mL/minute. The valve was turned and this first 60 ml sample pushed out of the sample syringe into the atmosphere. The valve was turned again and another 60 mL sample of soil gas was drawn into the syringe. The entire closed valve assembly was removed from the tubing and left on the end of the syringe. The syringe was then placed in a small empty cooler to protect the

sample from direct sunlight (Photo 7). The cooler with the syringe inside was then transported to the onsite mobile laboratory for analysis.

- In areas where chlorinated hydrocarbons were detected using the technique described above, additional sample locations were chosen in an attempt to more precisely determine the location of source areas. For this purpose, only enough purge volume was removed to purge the sample tubing. The tubing and vapor tip held approximately 70 mL of volume. The purge volume for these samples was set at 240 mL to ensure that the sample would be only soil-gas and not ambient air left in the sampling stream. For these samples, the air pump was not used. Instead, the sampling syringe was used to withdraw a sample from the sampling tube at a rate of 60 mL/minute. The syringe valve was adjusted and the collected gas was expelled into the PID tip for PID measurement. This process was repeated four times. On the fifth time, the collected sample was saved and put in the cooler for transport to the mobile laboratory.

  Sample locations at which the smaller purge volume protocol was used are SG-63 through SG-66 and SG-82 through SG-103.

Appendix D contains the field notes recorded during the soil-gas survey.

After removing the push rods from each boring, the resulting hole was filled with bentonite chips to within a few inches of the surface, hydrated, and then sealed at the surface with either native soil or with asphalt as appropriate to match the surrounding area.

2.2 CONSTITUENTS OF CONCERN

The constituents of concern ("COCs") as dictated by EPA for this investigation were tetrachloroethylene ("PCE"), trichloroethylene ("TCE"), and the degradation products 1,1-dichloroethylene ("1,1-DCE"), cis-1,2-dichloroethylene ("cis-1,2-DCE"), trans-1,2-dichloroethylene ("trans-1,2-DCE"), and vinyl chloride ("VC").

2.3 LABORATORY ANALYSES

Soil-gas samples collected in plastic syringes were extracted within 30 minutes of collection by the onsite laboratory provided by H&P Laboratory and analyzed within 4 hours of extraction.

These samples were analyzed using EPA Method 8260 modified for air analyses with sample results reported in μg/L. The detection limit for all analyses was 1 μg/L.

2.4 DECONTAMINATION

Before drilling at each location, the vapor sample housing, including the tip and the perforated steel tube through which the vapor sample was collected, was washed using the standard three-bucket wash technique with Alconox™ detergent and clean water. The washed pieces were then allowed to dry in the sun after cleaning.

After each sample, the Teflon® tubing was evacuated with purified air from a cylinder located on the drill rig. Periodically, the Teflon® tubing was changed when it became discolored or bent during drilling. New tubing was always used at the beginning of each day.

2.5 INVESTIGATION DERIVED WASTES

Due to the direct-push drilling method employed, soil waste was not generated. The wash water used to decontaminate the sampling equipment was less than one gallon per day. At the end of the day, the water was placed into a 5-gallon bucket and allowed to evaporate (daytime temperatures were greater than 100 degrees F). Other wastes, including gloves, tubing, etc. were placed in trash bags and disposed of in the on-site trash receptacle.

2.6 QUALITY ASSURANCE / QUALITY CONTROL

2.6.1 Duplicate Samples

At an interval of approximately once every 10 samples, a duplicate syringe sample was collected. These samples were collected immediately after the original sample, having purged 60 mL of soil-gas between the original sample and the duplicate to clear any ambient air from the system. These duplicate samples were analyzed by the on-site mobile laboratory using EPA Method 8260. These samples are distinguished from the original samples by having the extension "8260D" added to the sample name.

For most locations where 8260 duplicates were collected, a second duplicate was also collected in steel laboratory-cleaned vacuum canisters. These samples were hand delivered on a daily basis to

Aerotech Environmental Laboratory in Phoenix, Arizona. Aerotech provided the clean canisters and the sample flow restriction connectors. The connectors allowed a sample flow rate of 0.5 liters/ minute. The sample vessels held approximately 2.7 liters and were allowed to fill for approximately 6 minutes to ensure that the vacuum in the canister would be zero (Photo 8).

These samples were analyzed using EPA Method TO-15. The TO-15 sampling and analysis method is both more accurate and more precise than the 8260 method. The detection limit for the TO-15 analyses varied with each sample. However, in general, the detection limit was between 0.003 and 0.1 μg/L. The TO-15 duplicates were collected for comparison to the mobile laboratory results.

2.6.2 Field Equipment Blanks

Field Equipment blanks were collected at random intervals during the investigation. Blanks were always collected after decontaminating the sample apparatus but before changing the sample tubing to a new clean tube. Samples were typically collected after elevated PID readings were observed at a location or after a series of detections were reported by the laboratory. In general, field equipment blanks were not deemed necessary when COCs were not detected in samples after laboratory analysis. By definition, adverse soil-gas carryover could not have been occurring where laboratory analysis did not indicate concentrations above detection limits.

2.6.3 Third-Party Field Oversight

On behalf of EPA, field activities were overseen periodically by Mr. Ryan Pollyea of Shaw Environmental, Inc. Periodically during each day of the soil-gas survey, Mr. Pollyea would observe the drilling and sampling methods and was kept informed of progress and of any circumstances that arose that were out of the ordinary.

In addition, on June 15, 2004, Mr. Wayne Schiemann from the U.S. Army Corps of Engineers was at the Site for a number of hours observing the drilling and sampling.

2.6.4 Deviations From Work and Sampling Plan

The following lists situations in which the standard method of drilling and sampling was not followed or where other circumstances required modification of standard practices.

1. On June 9, a TO-15 duplicate sample was collected from location SG-8. This sample was collected immediately after the SG-FEB1 equipment blank spiked with 1,1-difluoroethane was collected. Based on information from Aerotech laboratory about this sample, it is likely that 1,1-difluoroethane carried over to the SG-8 sample. It was decided to not analyze this sample but to collect another TO-15 sample instead. Sample SG-10-10-TO15D was sampled in place of the aborted SG-8 sample.

2. During the analysis of the duplicate sample from location SG-26 on June 11, the laboratory experienced instrument failure. Upon restarting the instrument and using another aliquot of sample, the surrogate analyses were out of range. The third analysis of this sample was successful. However, because of the two previous analysis attempts, the sample volume available for the third analysis was less than the standard amount. Therefore, the detection limit for sample SG-26-10-8260D was increased from 1 μg/L to 10 μg/L.

3. On June 15, a number of samples (SG-44, SG-47, and SG-48) were reported by the laboratory to have low levels of the 1,1-difluoroethane in them. These levels were less than the reporting limit of 10 μg/L. The sample from location SG-51 was reported to have greater than 10 μg/L 1,1-difluoroethane. Based on the sampling method, it was suspected that these leak-check detections did not represent a leak in the system, but were likely caused by an inadvertent contamination of the system with the compound. Up until that point, the 1,1-difluoroethane was being stored in a bag in the same box as the sampling syringes. After location SG-51, the 1,1-difluoroethane bag and the sampling syringes were put on opposite sides of the drill rig. A fresh box of syringes was used. From that point on, no other detections of the leak-check compound were reported.

   To ensure that the original sample from SG-51 was not, in fact, caused by a leak in the sample stream, a second boring (SG-51R) was drilled and sampled at this location within two feet of the original. No COCs were detected in either SG-51 or SG-51R.

4. On June 28, the mobile laboratory experienced temporary problems with the electrical generator. To make sure that the holding time would not be missed, the sample from location SG-91 was collected using a mini steel vacuum canister provided by H&P Laboratory. This canister was 350 mL in volume and took approximately two minutes to fill.

5. On June 29, the field work extended beyond the 12-hour window during which the mobile laboratory needed to run their initial and final calibration standards. Therefore, samples from location SG-102 and SG-103 were not collected in a syringe but were collected in the mini steel vacuum canisters provided by H&P Laboratory. These samples were driven back to Los Angeles, California in the mobile laboratory and were analyzed by H&P at their fixed-base facility in Los Angeles.

6. The chain-of-custody on which samples SG-72, SG-73, SG-74, SG-79, and SG-81 originally incorrectly listed the sample names and depths for these samples. The chain-of-custody was corrected and the database was updated to reflect this change.

3 SOIL-GAS SAMPLING RESULTS

Laboratory reports with chromatograms for all soil-gas sample analyses can be found in Appendix E. Appendix E also contains a CD-ROM on which all of the laboratory data has been stored electronically on Microsoft Excel® spreadsheets.

3.1 FIELD SAMPLES

The results of the soil-gas analyses by the mobile laboratory are presented on Table 2 (Appendix C). Table 3 presents only those locations where concentrations of COCs above 1 μg/L were detected. These detections are also plotted on Figures 3 and 4.

Detectable concentrations of the COCs were found at only 22 of the 103 sample locations. PCE and trans-1,2-DCE were not detected above 1 μg/L at any of the locations. The highest concentration of any COC found was 7.5 μg/L of TCE at location SG-100.

There were no COC detections in any of the locations south of the portion of the yard currently used by Union Pacific (i.e. no detections in the automobile storage area, retention pond, truck wash, etc.). There were also no COC detections on the west end of the yard.

In only three areas of the yard where COCs were detected:

1. Former Roundhouse Area: Five locations had detectable VC only (Figure 3). All detections were below 2.5 μg/L. These detections do not indicate this area as a "source".

2. Locomotive Parts / Drum Storage Area: Ten locations had detectable concentrations of TCE, 1,1-DCE, cis-1,2-DCE, and VC (Figures 3 and 4). The first sample location to have had a detection in this area was SG-56. From there, 20-foot step-outs and then 40+ foot step-outs found the other locations, ending at the spur line, where similar chemical analyses exist. As with the roundhouse area, concentrations are very low (less than 7 μg/L) and do not indicate groundwater impact from surface activities at the rail yard.

3. Southeastern Yard Area: This area is south of the spur track noted above and north of the main track that makes up the southern portion of the working rail yard (Figures 3 and 4). Soil-gas samples in this area are distinct from those samples collected north of the spur line in that only TCE had detectable concentrations at seven locations. The highest TCE concentration in this area was 7.5 µg/L from SG-100. Here again, this detection does not indicate this area as a "source".

3.2 QUALITY ASSURANCE / QUALITY CONTROL SAMPLES

3.2.1 Duplicates

Comparison of the field samples, field sample duplicates, and fixed laboratory duplicates are shown on Table 4. There were 12 sets of duplicates, 10 of which included duplicates run at the fixed-base laboratory using Method TO-15. In general, the detection limit for the TO-15 method is 1000 times lower than for the 8260 method used by the mobile laboratory.

There were no sample pairs having a detection in the 8260 duplicate and no detection in the original. There was one sample (SG-64-10) in which there was a detection in the original while the 8260 duplicate reported no detection. All sample pairs between the original samples and the TO-15 duplicate agreed on nondetections at the field detection limit of 1.0 µg/L.

There were only four sample pair locations with any COC at a detectable (greater than 1.0 µg/L) concentration: SG-64, SG-82, SG-89, and SG-94. Table 4 lists the relative percent difference ("RPD") between the original sample and the 8260 duplicate as well as the RPD between the original sample at the TO-15 duplicate for these sample pairs. Of the 15 comparisons (looking at all locations for all constituents), the RPD was greater than 30 percent for 9 of them.

As discussed on Page 6 of the independent sample validation report (Appendix F), when constituent detections are within five times the reporting limit (in this case, less than 5 µg/L since the reporting limit was 1 µg/L), comparison of duplicates using RPD is not a valid method. In this case, duplicate precision is assessed by using a difference of four times the reporting limit as a guide. The differences between all of the 8260 duplicate pairs are within four times the reporting limit (4 µg/L).

There was only one sample result (TCE at SG-94) in which the TO-15 result was greater than the original sample. In none of the TO-15 sample pairs were any of the duplicate results greater than four times the reporting limit.

3.2.2 Background Sample

Sample location SG-80, located near the west boundary of the yard, was chosen for background sample location based on the fact that no known railroad activities have taken place in this area since the time chlorinated hydrocarbons were available for general solvent use. As shown on Table 4, the 8260 original and duplicate samples did not have detectable concentrations of any of the COCs and the TO-15 sample had only low levels of TCE and PCE. Surprisingly, this location had the highest PCE detection (0.38 μg/L) of any of the locations in which PCE was detected. We believe this demonstrates the ubiquity of chlorinated hydrocarbons in the subsurface throughout the metro Phoenix area.

3.2.3 Field Equipment Blanks

Field equipment blank results are shown on Table 5. None of the COCs were detected in any of the field equipment blanks.

To confirm that the leak-check compound (1,1-difluorethane) could be detected by the method, the cloth being used to hold the leak-check compound was saturated and placed over the vapor tip during the collection of SG-FEB1. As shown on Table 5, the 1,1-difluorethane was detected in sample SG-FEB1 as reported by the mobile laboratory.

3.2.4 Independent Data Review

Laboratory data from both the mobile laboratory and the fixed-base laboratory were validated by Diane Short & Associates, an independent data review company located in Lakewood, Colorado. The report from Diane Short & Associates can be found in Appendix F. Notwithstanding some documentation deviations on the chain-of-custody forms, the conclusion of the validation report is that "data are considered to be usable for project purposes ... . No qualifiers have been issued."

4 DISCUSSION OF RESULTS

4.1 SOIL-GAS CONVERSION TO TOTAL SOIL CONCENTRATIONS

In order to realistically assess the impact, if any, of the soil-gas data, the soil-gas results have been converted to soil concentrations using an equation presented in the CH2M Hill Technical Memorandum entitled "Proposed Application of the Groundwater Protection Level Model at the Honeywell 34th Street Facility." The memo is dated January 14, 2003 and was submitted to Kris Kommalan (Paschall) of the ADEQ.[1/]

Chemical properties of the COCs were taken from on-line sources. The highest concentration of each of the COCs found in the June soil-gas investigation was used as input to this equation (C_V). Once total soil concentrations were obtained for each COC, these values were compared against Arizona Soil Remediation Levels as published in the Arizona Administrative Code (AAC), Title 18, Chapter 7, Article 2, Appendix A for both residential and industrial concentrations. The Arizona SRLs are Tier 1 soil cleanup levels deemed protective of human health and the environment.

A Microsoft Excel spreadsheet (Appendix C) was used to calculate C_T, the total soil concentration at the Site. Below are the results of this analysis.

1/ We understand this equation has been used by the EPA and ADEQ to conduct plug-in evaluations at several subsites within the South Indian Bend Wash Superfund Site (CH2MHill 2003) and there is no reason for it to not be applicable here. The South Indian Bend Wash Superfund Site is located in the Phoenix metro area (the City of Tempe) not far from the Phoenix rail yard. Therefore, use of this equation for analysis of the soil-gas results from the Phoenix rail yard is appropriate because presumably it has already been accepted at other nearby sites by both EPA and ADEQ. The equation presented by CH2MHill is as follows: $C_T = ((((K_D)(P_b)/K_H) + (\theta_w/K_H) + (\theta_T - \theta_w))(C_V))/P_b$.: Where C_T = total soil concentration (μg/kg); C_V = total soil-gas concentrations (μg/L); K_D = soil-water partition distribution coefficient [K_{oc} * f_{oc}] (L/kg); P_b = bulk density (kg/L); K_H' = Henry's law constant (dimensionless); θ_w = volumetric water content (dimensionless); θ_T = total porosity (dimensionless); K_{oc} = organic carbon partition coefficient (L/kg); f_{oc} = fraction organic carbons (dimensionless)

TOTAL SOIL CALCULATION RESULTS

	TCE	1,1-DCE	CIS-1,2-DCE	VC
C_T – (maximum calculated soil concentration at UPRR site.)	2,633	78	8,327	11

SRL - Residential	27,000	360	31,000	16
SRL - Industrial	70,000	800	100,000	35

a. All values in µg/kg

As shown on the table above, the soil-gas COC concentrations detected at the Site do not represent soil concentrations that would require any additional remedial activity.

4.2 FORMER ROUNDHOUSE AREA

Detections indicate historical release of chlorinated hydrocarbons in this area (i.e. detections are not caused by an upgradient source). Locations where detectable vinyl chloride occur are completely surrounded by other locations with non-detectable concentrations. There is also no distinct "source" location – as all soil gas concentrations were very low between 1.0 and 2.1 µg/L detected from five locations spread out over approximately 25,000 square feet. The data show degradation to minimal levels of vinyl chloride only indicative that historical releases are highly unlikely to have impacted groundwater. It is our opinion that because there is no source location, any further soil sampling and/or assessment is unnecessary in this area.

4.3 LOCOMOTIVE PARTS / DRUM STORAGE AREA – SOUTHEAST YARD AREA

These two areas, although somewhat distinct in chemical signature, need to be grouped together because their source is likely the same. That source is the known soil and groundwater impact of TCE located in the Adobe Air (Arvin) Facility located approximately 200 feet adjacent to and southeast of the rail yard. Information about the Arvin site relevant to the chlorinated hydrocarbon detections observed during the June 2004 soil-gas survey was obtained from the report, "Soil Contamination Source Removal and Groundwater Monitoring, North End of Warehouse Building, Adobe Air (Arvin) Facility, 500 South 15th Street, Phoenix, Arizona"

prepared for Arvin by the environmental firm Scott, Allard & Bohannan, Inc on March 24, 1995 and submitted to ADEQ ("SAB" 1995). This report states the following:

- An initial investigation at the Arvin site conducted in 1989 found soil impacted with TCA, PCE, and 1,2-DCE.

- In 1991, six monitoring wells were installed around the Arvin site. Groundwater samples were collected from these wells quarterly for one year in 1992. Water levels from these wells indicated a general localized direction of groundwater flow from the Arvin site toward the UPRR rail yard.

- In 1994, soil impacted with chlorinated hydrocarbons was left in place following limited excavation in the warehouse area. Subsequent use of the VLEACH model by SAB indicated that residual TCE remaining in subsurface soil at the Arvin site would impact groundwater.

- Groundwater from well MW-4, located on the extreme northwest side of the facility, consistently had elevated concentrations of TCE, 1,1-DCE, 1,2-DCE, 1,1,-DCA, and PCE. Of these constituents, TCE was the most abundant by approximately an order of magnitude over the other constituents.

A soil-gas survey conducted in 1993 at the Arvin site found TCE as the predominant contaminant with lesser concentrations of the degradation products.

In the 2004 soil-gas samples from the rail yard, all of the samples south of the spur track with detections had detections of TCE only. Since the TCE detections were near the detection limit, concentrations of other chlorinated hydrocarbons from the same source would be below the detection limit and not reported. Therefore, the chemical signature of the soil-gas is consistent with the chemical signature of the alleged source area. As shown on Figures 3 and 4 of SAB 1995, the location of the TCE-source area at the Arvin site in conjunction with groundwater flow directions indicated by the well monitoring data at the Arvin site clearly show that TCE-impacted groundwater from the Adobe facility has migrated to the UPRR rail yard. However, since SAB 1995, no further assessment of the offsite migration of chlorinated hydrocarbons from the Arvin site was ever undertaken.

The 2004 soil-gas detections of chlorinated hydrocarbons in the drum storage area can also be linked to Arvin. The appearance of degradation product in this area is easily explained and can be attributed to petroleum hydrocarbons that were also present. It is well known and reported in the technical literature that the presence of petroleum hydrocarbons greatly accelerates the degradation of chlorinated hydrocarbons because the biodegradation of chlorinated hydrocarbons is a secondary or co-metabolic process; the degradation of the petroleum being the primary process. In essence, the petroleum hydrocarbons acted a catalyst for degradation of the TCE.

Although they were not reported, H&P Laboratory made some qualitative assessments of petroleum hydrocarbons in locations SG-64, SG-88, SG-89 based on the chromatograms provided in Appendix F. These three locations are north of the spur track. This same information was also obtained from three locations south of the spur track: SG-85, SG-92, and SG-101. H&P reported that, based on the chromatograms from these locations, there was approximately an order of magnitude more petroleum hydrocarbons present in the locations north of the spur track than from the locations south of the spur track. All samples south of the spur track were reported to have petroleum hydrocarbon concentrations below the reporting limit.

The presence of petroleum hydrocarbons in the drum storage area coupled with localized groundwater flow provide a plausible argument that the chlorinated hydrocarbons north and south of the spur track originated from the same source but are being degraded at different rates due to varying chemical environments – the common source being the Adobe facility.

However, the soil-gas concentrations found in these areas are relatively low and the area of detected chlorinated hydrocarbons in the locomotive parts / drum storage area is bounded to the west, north, and east by areas where such constituents of concern have never been found. This indicates a confined impact only and thus that there is no chemical or hydrologic link between the chlorinated hydrocarbons in the locomotive parts / drum storage area and the wide-spread impacts associated with the Motorola plume.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 SIGNIFICANCE OF CHLORINATED HYDROCARBON IMPACT

- No "source" areas in soil could be identified anywhere at the Site. Low level concentrations of chlorinated hydrocarbons and degradation by-products detected over relatively large areas make it highly unlikely that were historical releases of any COCs impacting groundwater at the rail yard.

- Soil concentrations calculated from the data June 2004 soil-gas survey data are below Arizona Soil Remediation Levels for both residential and industrial site uses.

- Information gained from the historical record including recent sampling data and groundwater contours show that past activities at the Union Pacific rail yard cannot otherwise be contributing to chlorinated hydrocarbons in the Motorola plume.

5.2 IMPACTS IN THE FORMER ROUNDHOUSE AREA

- No clear source location of vinyl chloride was established during the soil-gas survey.

- The area of VC detections is surrounded on all sides by locations where chlorinated hydrocarbons, including VC, were not detected. This indicates that groundwater impact and subsequent transport away from the source area did not likely occur.

- Vinyl chloride has not been detected in groundwater samples from OU3.

5.3 IMPACTS IN THE LOCOMOTIVE PARTS / DRUM STORAGE AREA AND THE SOUTHEAST YARD AREA

- The low TCE detections and TCE plus degradation products detected in the locomotive parts storage area and southeast yard area most likely have their source at the Arvin Industries site. This site is located adjacent to the UPRR yard and has known chlorinated hydrocarbon impacts from previous documented use of chlorinated hydrocarbons.

- Since only low levels of TCE and TCE-degradation products were found in this relatively large area of the UPRR yard, there is no indication that the original release site of these compounds is located on the UPRR yard.

- Geographic correlation of elevated concentrations of petroleum hydrocarbons at the UPRR site with the presence of TCE degradation products indicates that the source of chlorinated hydrocarbons in the southeast yard area and the locomotive parts / drum storage area are likely the same.

- With this area being completely surrounded by locations with non-detectable chlorinated hydrocarbon concentrations in soil-gas (except on the southeast side that abuts the Arvin site), there is no connection between the chlorinated hydrocarbon impacts detected in these areas and the Motorola plume.

- Soil-gas concentrations were relatively small and do not indicate the possibility of wide-scale impact nor impact to yard soil at a concentration even sufficient to require soil remediation.

- The Motorola plume is located north of the Site. The areas of the Site where chlorinated hydrocarbons were detected are all bounded to the north by locations were chlorinated hydrocarbons were not detected. Therefore, the impacts at the Site are chemically disconnected from the Motorola plume.

5.4 RECOMMENDATIONS

- Any further investigation of Site soils would be unproductive without clearly identified, significant source areas. Therefore, further investigation of Site soils is unwarranted.

- Past releases of chlorinated hydrocarbons in the roundhouse area are not indicated beyond a minor or confined local impact. With neither a clear "source" area for these compounds nor concentrations reasonably indicative of groundwater impact, no further investigation or remedial effort in this area is needed.

- Chlorinated hydrocarbon impacts in the locomotive parts / drum storage area and the southeast yard area are locally. Offsite impacts are implicated from the adjacent Arvin

Industries site. Because these impacts appear to be minor and contained within these areas, no further investigation of these areas is warranted.

6 REFERENCES

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The Forrester Group, Inc., May 17, 2004(D), "Draft Quality Assurance Project Plan", Union Pacific Railroad, Phoenix Rail Yard, Phoenix, Arizona.

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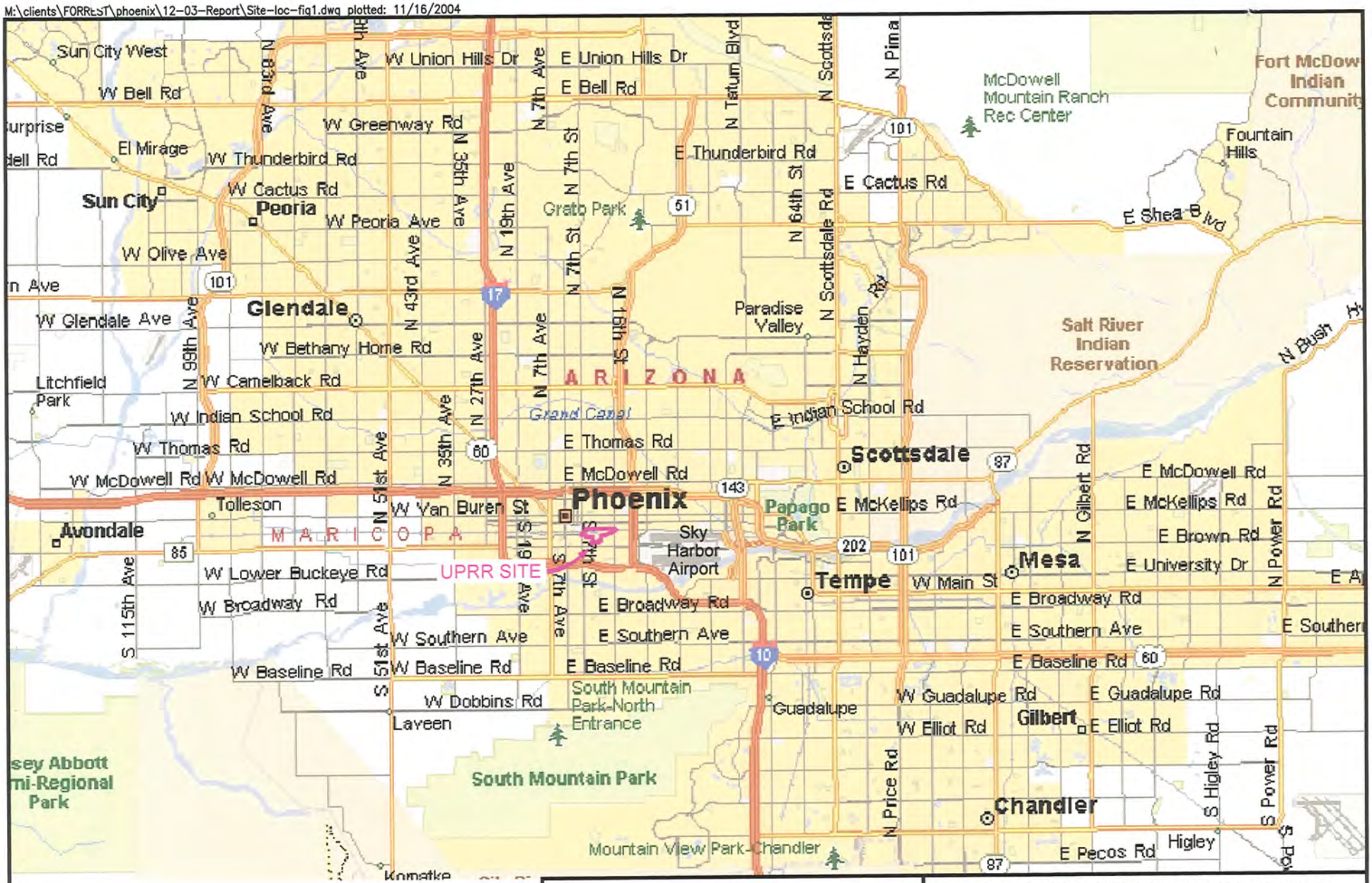
APPENDIX A
FIGURES

M:\clients\FORREST\phoenix\12-03-Report\Site-loc-fig1.dwg plotted: 11/16/2004



THE FORRESTER GROUP
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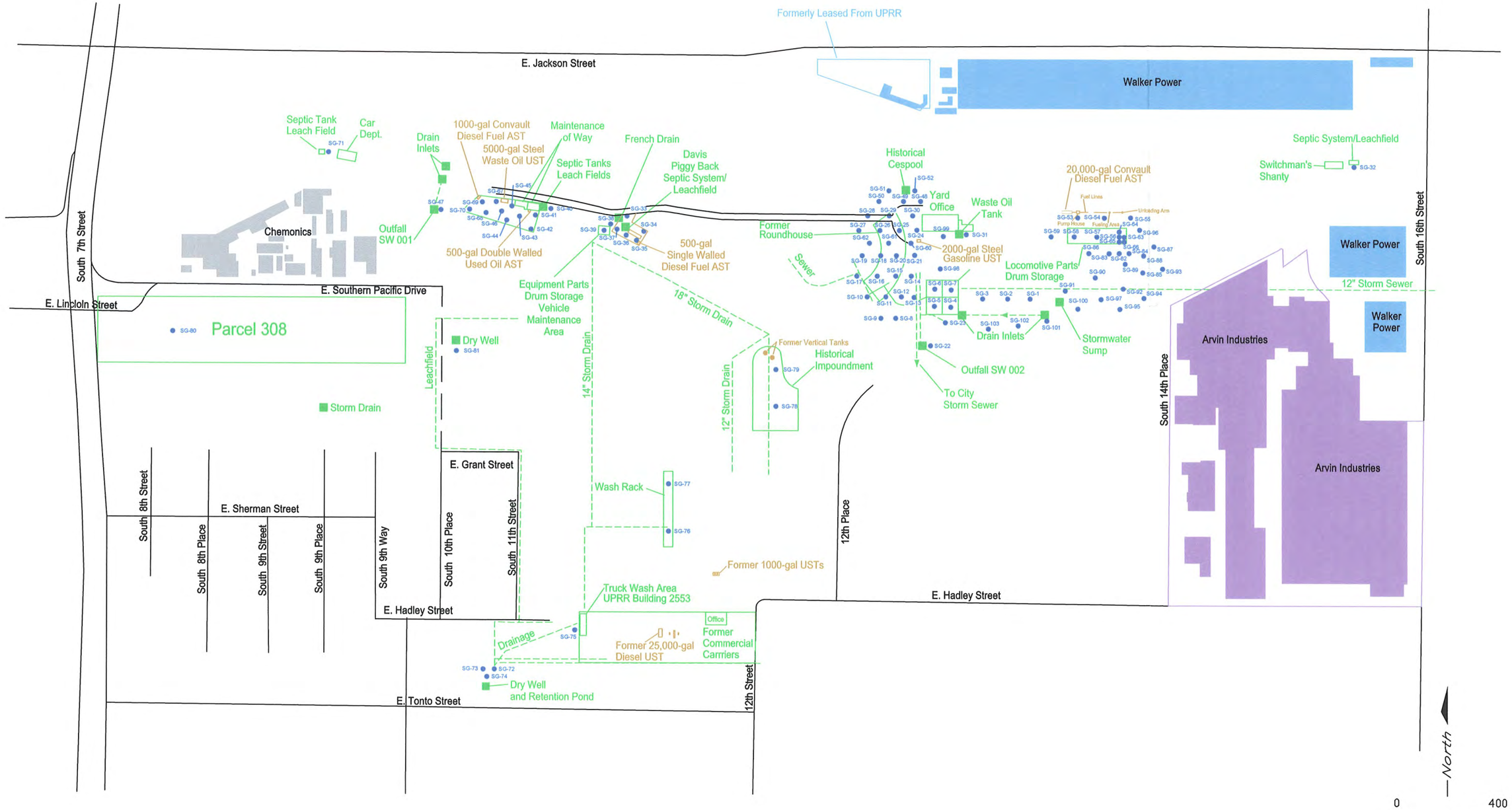
UNION PACIFIC RAILROAD-PHOENIX YARD

FIGURE 1

SITE LOCATION MAP

SCALE:	DATE:
	9/5/03



LEGEND

- SOIL-GAS SAMPLE LOCATION

UNION PACIFIC RAILROAD PROPERTY

	BY	DATE
DRAWN	FR	7/14/04
CHECKED		
REVISED		
APPROVED		
APPROVED		

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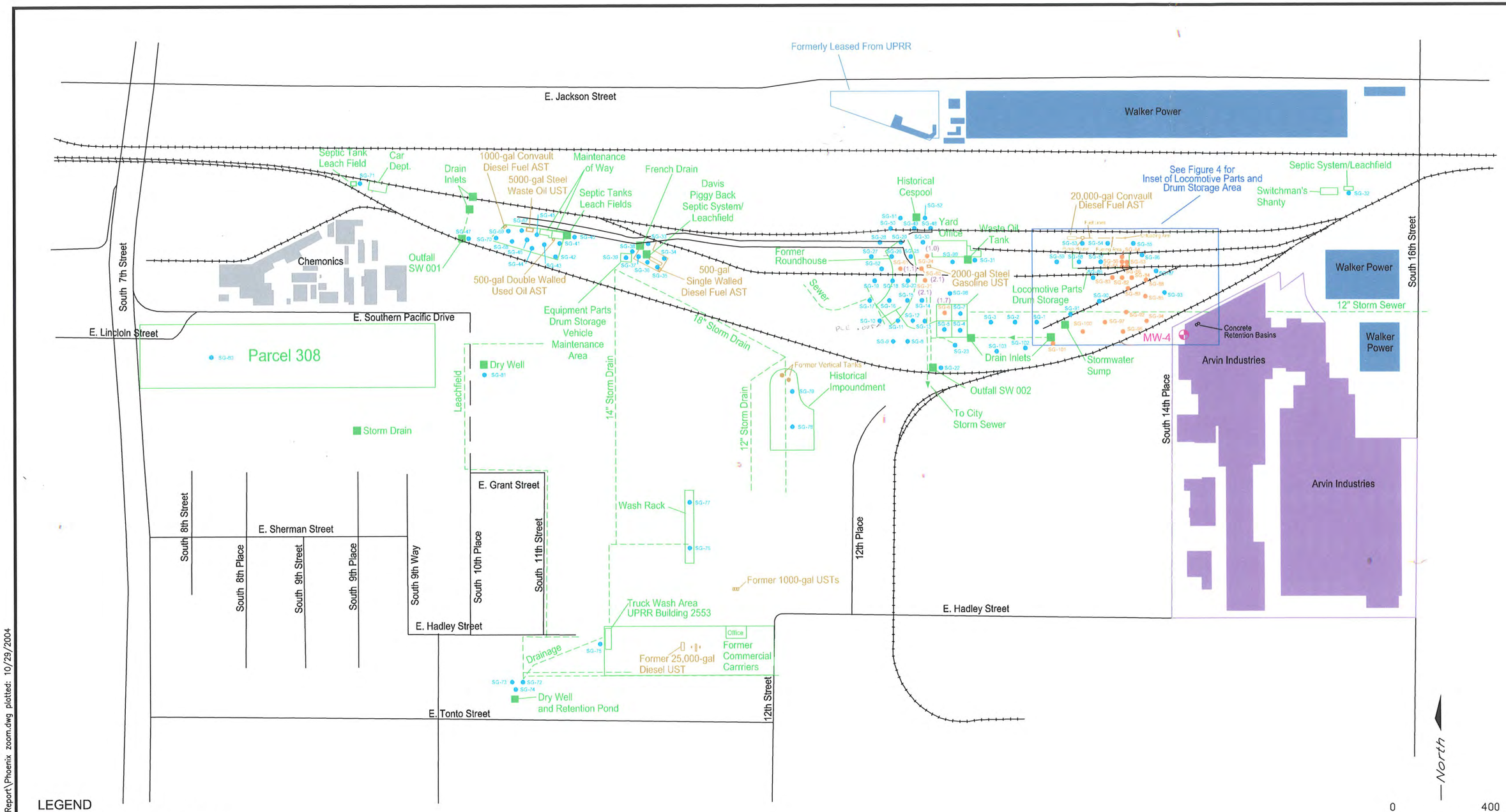
UNION PACIFIC RAILROAD-PHOENIX YARD

FIGURE 2
SITE LAYOUT AND SOIL-GAS SAMPLE LOCATIONS MAP
JUNE 9-29, 2004

SCALE: 1"=400'

DWG. NO.: Phoenix zoom-nodata.dwg

M:\clients\FORREST\phoenix\12-03-Report\Phoenix zoom-nodata.dwg plotted: 11/16/2004



LEGEND

- MONITORING WELL LOCATION
- SAMPLE LOCATION WITH NO DETECTION
- SAMPLE LOCATION WITH VOC DETECTION
- (1.0) MOBILE LAB ANALYSIS RESULT FOR VINYL CHLORIDE IN (µg/L)

NOTE: DETECTION LIMIT FOR ALL VOCs IS 1 µg/L

AT LOCATIONS WITH DETECTABLE VOC CONCENTRATIONS, VINYL CHLORIDE WAS THE ONLY VOC DETECTED EXCEPT IN LOCOMOTIVE PARTS STORAGE AREA (SEE FIGURE 4)

	BY	DATE
DRAWN	FR	12/3/03
CHECKED		
REVISED	FR	7/1/04
APPROVED		
APPROVED		

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UNION PACIFIC RAILROAD-PHOENIX YARD

FIGURE 3
SOIL GAS SAMPLE RESULTS MAP

SCALE: 1"=400'

DWG. NO.: Phoenix zoom.dwg

M:\clients\FORREST\phoenix\12-03-Report\Phoenix zoom.dwg plotted: 10/29/2004

20,000-gal Convault Diesel Fuel AST

Pump House

Fuel Lines

Fueling Area

Unloading Arm

SG-53 SG-54 SG-55

Locomotive Parts Drum Storage

SG-64 (1.1)

(2.5) (2.3) (1.2)

SG-56 SG-63

(2.4) (2.2) (1.2) (1.1)

SG-96

SG-59 SG-58 SG-57

(3.9) (3.9) (1.5) (1.7)

SG-65 SG-66

(3.3) (3.4) (1.4) (3.5)

SG-87

SG-86

SG-83 SG-82 SG-84

(5.1) (4.8) (1.4)

(5.8) (6.9) (1.4) (1.5)

(4.2) (4.7) (1.2) (3.6)

SG-88

(2.5) (2.9) (1.1) (3.5)

Spur Line

SG-89

(3.8) (3.2) (1.1) (1.6)

SG-93

SG-85

(1.7)

SG-90

12" Storm Sewer

(3.9)

SG-92

SG-91

Stormwater Sump

SG-97

(1.5)

SG-94

(3.5)

SG-1

SG-100

(7.5)

SG-95

(3.3)

Drain Inlet

SG-101

(4.8)

Concrete Retention Basins

MW-4

Sampled October 1992	
1,1-DCA	6.9
1,1-DCE	3.3
1,2-DCE	5.2
PCE	0.8
1,1,1-TCA	2.4
TCE	40.8

Arvin Industries

LEGEND

- MONITORING WELL LOCATION
- SAMPLE LOCATION WITH NO DETECTION
- SAMPLE LOCATION WITH VOC DETECTION
- (1.0) MOBILE LAB ANALYSIS RESULT IN (µg/L)

(3.4) 1,1-DCE
(3.3) CIS-1,2-DCE
(1.4) VINYL CHLORIDE
(3.5) TCE

NOTE: DETECTION LIMIT FOR ALL VOCs IS 1 µg/L

North

0 50

FEET

	BY	DATE
DRAWN	FR	7/1/04
REVISED		
REVISED		
REVISED		
REVISED		

THE FORRESTER GROUP
INSIGHTFUL ENVIRONMENTAL SOLUTIONS

UNION PACIFIC RAILROAD-PHOENIX YARD

Figure 4

INSET OF LOCOMOTIVE PARTS AND SOUTHEAST YARD AREA

SCALE: 1"=50'

DWG. NO.: Phoenix zoom.dwg

M:\clients\FORREST\phoenix\12-03-Report\Phoenix zoom.dwg plotted: 11/16/2004

APPENDIX B
SITE PHOTOGRAPHS

Photographs From Soil-Gas Investigation
Union Pacific Railroad, Phoenix Rail Yard
Phoenix Arizona, June 2004

1

1
Direct-push drill rig. Jackhammer pounds hollow pipe into ground to desired depth. Bottom of pipe is equipped with vapor-probe tip.

2

2
Vapor probe tip exposed to show perforated pipe through which vapor sample is collected.

3

3
The surface was sealed with hydrated bentonite clay to prevent sampling air from the surface.

4

4
A towel saturated with 1,1-diflouroethane was placed over the bentonite seal to provide a method for checking for leaks from the surface.

5

5
Teflon® tubing exiting the top of the push rod connected to sample syringe valves, filter, flow meter, then vapor purpe pump (see Photo 6 below).

6

6
Showing flow meter, vapor purge pump, and vacuum gauge. PID is yellow instrument resting on box on right.

7

7
Sample syringe after sampling in cooler for delivery to on-site mobile laboratory.

8

8
Duplicate sampling using steel canister.

APPENDIX C
TABLES

Table 1
Soil-Gas Purging Data
UPRR Phoenix, Arizona
June 2004

Date	Sample Location	PID (ppm)	Time (min:sec)	Vacuum (in)	Ambient (ppm)
6/9/2004	SG-1-9.5	0.0	0	0	0
6/9/2004	SG-2-10	4.5	1:30	0	0
		5.3	5:00	0	0
		6.2	7:15	0	0
		6.5	10:00	0	0
6/9/2004	SG-3-10	0.0	2:40	0	0
		0.0	10:00	0	0
6/9/2004	SG-4-10	0.8	2:22	0	0
		1.2	6:00	0	0
		1.1	2:36	0	0
6/9/2004	SG-5-10	1.0	2:30	0	0
		1.2	12:00	0	0
6/9/2004	SG-6-10	0.0	1:00	0	0
		0.0	6:00	0	0
		0.0	12:00	0	0
6/9/2004	SG-7-10	0.0	1:00	0	0
		0.0	10:00	0	0
6/9/2004	SG-8-10	2.5	4:00	0	0
		2.0	8:45	0	0
6/9/2004	SG-9-10	1.6	5:01	0	0
		1.8	8:30	0	0
		1.5	10:00	0	0
6/10/2004	SG-10-10	0.4	2:00	0	0
		0.4	10:00	0	0
6/10/2004	SG-11-10	1.6	1:00	0	0
		2.0	6:00	0	0
		1.6	10:00	0	0
6/10/2004	SG-12-10	11.0	2:40	0	0
		13.2	4:00	0	0
		15.2	0:00	0	0
6/10/2004	SG-13-10	12.5	2:45	0	0
		13.5	6:45	0	0
		13.5	0:00	0	0

Table 1
Soil-Gas Purging Data
UPRR Phoenix, Arizona
June 2004

Date	Sample Location	PID (ppm)	Time (min:sec)	Vacuum (in)	Ambient (ppm)
6/10/2004	SG-14-10	10.8	2:00	0	0
		10.0	7:00	0	0
		3.0	0:00	0	0
6/10/2004	SG-15-10	11.2	2:00	0	0
		15.1	4:00	0	0
		18.1	0:00	0	0
6/10/2004	SG-16-10	13.8	2:15	0	0
		13.3	5:15	0	0
		13.2	0:00	0	0
6/10/2004	SG-17-10	5.7	3:00	0	0
		4.3	6:30	0	0
		4.7	0:00	0	0
6/10/2004	SG-18-9.5	8.5	1:00	0	0
		13.0	6:00	0	0
		13.4	11:00	0	0
6/10/2004	SG-19-10	10.2	2:00	0	0
		9.7	8:30	0	0
6/11/2004	SG-20-9	4.8	1:50	0	0
		5.2	5:00	0	0
		2.9	0:00	0	0
6/11/2004	SG-21-10	10.7	1:00	0	0
		11.4	0:00	0	0
6/11/2004	SG-22-9	5.5	1:45	0	0
		3.3	8:15	0	0
6/11/2004	SG-23-10	0.6	4:30	0	0.4
		0.6	7:00	0	0.4
		0.6	0:00	0	0.4
6/11/2004	SG-24-10	9.4	1:00	0	0.9
		15.3	7:03	0	0.9
		16.2	0:00	0	0.9
6/11/2004	SG-25-10	11.8	2:15	0	0
		12.7	8:30	0	0
		12.8	0:00	0	0

Table 1
Soil-Gas Purging Data
UPRR Phoenix, Arizona
June 2004

Date	Sample Location	PID (ppm)	Time (min:sec)	Vacuum (in)	Ambient (ppm)
6/11/2004	SG-26-10	9.0	2:00	0	0.4
		10.7	7:00	0	0.4
		10.7	0:00	0	0.4
6/11/2004	SG-27-10	1.6	2:24	0	0.7
		0.1	8:30	0	0.7
		0.0	0:00	0	0.7
6/11/2004	SG-28-10	0.0	3:00	0	0.6
		0.0	6:15	0	0.6
		0.0	0:00	0	0.6
6/14/2004	SG-29-10	0.6	1:45	0	0
		0.0	0:00	0	0
6/14/2004	SG-30-10	3.9	4:00	0	0
6/14/2004	SG-31-10	8.9	1:30	0	0
		6.8	6:45	0	0
		3.2	0:00	0	0
6/14/2004	SG-32-10	4.3	1:00	0	0
		1.2	7:00	0	0
		1.0	0:00	0	0
6/14/2004	SG-33-10	1.3	1:30	0	0
		0.8	6:30	0	0
		0.2	0:00	0	0
6/14/2004	SG-34-10	0.7	1:00	0	0
		0.3	7:45	0	0
		0.2	0:00	0	0
6/14/2004	SG-35-10	0.9	1:00	0	0
		0.1	8:45	0	0
		0.1	0:00	0	0
6/14/2004	SG-36-10	0.5	1:00	0	0
		0.3	6:20	0	0
		0.3	0:00	0	0
6/14/2004	SG-37-10	1.5	1:00	0	0.1
		1.0	4:00	0	0.1
		0.5	0:00	0	0.1

Table 1
Soil-Gas Purging Data
UPRR Phoenix, Arizona
June 2004

Date	Sample Location	PID (ppm)	Time (min:sec)	Vacuum (in)	Ambient (ppm)
6/14/2004	SG-38-10	0.7	1:30	0	0.4
		0.6	5:30	0	0.4
		0.3	0:00	0	0.4
6/14/2004	SG-39-10	0.6	2:45	0	0.2
		0.3	8:00	0	0.2
		0.2	0:00	0	0.2
6/14/2004	SG-40-10	0.6	6:15	0	0.2
		0.5	0:00	0	0.2
6/14/2004	SG-41-10	0.4	2:00	0	0.2
		0.5	6:30	0	0.2
		0.3	0:00	0	0.2
6/14/2004	SG-42-10	0.5	2:00	0	0.1
		0.5	6:30	0	0.1
		0.3	0:00	0	0.1
6/14/2004	SG-43-10	9.8	2:23	0	0.1
		13.7	8:00	0	0.1
		16.8	0:00	0	0.1
6/15/2004	SG-44-10	2.7	2:30	0	0.3
		1.6	8:00	0	0.3
		1.6	0:00	0	0.3
6/15/2004	SG-45-10	0.7	3:30	0	0
		0.7	7:45	0	0
		0.6	0:00	0	0
6/15/2004	SG-46-10	2.0	1:45	0	0.3
		1.0	6:00	0	0.3
		1.0	0:00	0	0.3
6/15/2004	SG-47-10	2.1	1:30	0	0.6
		1.6	6:30	0	0.6
		1.0	0:00	0	0.6
6/15/2004	SG-48-10	2.6	5:00	0	0.2
		2.4	7:15	0	0.2
		2.6	0:00	0	0.2
6/15/2004	SG-49-10	5.3	2:45	0	0
		2.1	7:00	0	0

Table 1
Soil-Gas Purging Data
UPRR Phoenix, Arizona
June 2004

Date	Sample Location	PID (ppm)	Time (min:sec)	Vacuum (in)	Ambient (ppm)
6/15/2004	SG-50-10	2.5	1:45	0	0
		2.3	8:00	0	0
		2.6	0:00	0	0
6/15/2004	SG-51-10	1.2	2:30	0	0.1
		0.8	6:00	0	0.1
		0.9	0:00	0	0.1
6/15/2004	SG-52-10	0.3	1:00	0	0.1
		0.5	6:00	0	0.1
		0.4	0:00	0	0.1
6/15/2004	SG-53-10	1.6	2:30	3.5	0.2
		0.7	8:00	3.5	0.2
		0.8	0:00	3.5	0.2
6/15/2004	SG-54-10	12.5	2:00	0	0.2
		26.4	5:45	0	0.2
		23.1	0:00	0	0.2
6/15/2004	SG-55-10	36.2	2:45	0	0.3
		35.0	6:15	0	0.3
		38.2	0:00	0	0.3
6/15/2004	SG-51R-10	5.7	4:00	0	0.2
6/15/2004	SG-56-10	41.4	2:45	0	0.4
		47.2	7:30	0	0.4
		51.6	0:00	0	0.4
6/15/2004	SG-57-10	14.4	3:15	0.5	0.5
		7.6	7:00	0.5	0.5
		4.4	0:00	0.5	0.5
6/15/2004	SG-58-10	7.1	0:15	0	0.4
		4.5	6:00	0	0.4
		4.4	0:00	0	0.4
6/16/2004	SG-59-10	2.2	3:30	0	0.3
		1.5	8:10	0	0.3
		1.1	0:00	0	0.3
6/16/2004	SG-60-10	13.1	3:00	0	0
		16.1	8:15	0	0
		16.7	0:00	0	0

Table 1
Soil-Gas Purging Data
UPRR Phoenix, Arizona
June 2004

Date	Sample Location	PID (ppm)	Time (min:sec)	Vacuum (in)	Ambient (ppm)
6/16/2004	SG-61-9	20.1	1:25	0	0.3
		12.2	6:00	0	0.3
		16.1	0:00	0	0.3
6/16/2004	SG-62-10	5.9	1:30	0	0.5
		6.3	6:45	0	0.5
		6.4	0:00	0	0.5
6/16/2004	SG-63-6	33.9	1:30	0	0
		42.2	2:36	0	0
		40.0	3:30	0	0
		40.4	5:00	0	0
6/16/2004	SG-64-10	11.0	1:00	0	0.4
		17.3	2:00	0	0.4
		18.7	3:00	0	0.4
		21.7	4:00	0	0.4
6/16/2004	SG-65-10	29.9	1:00	0	0.3
		73.1	2:00	0	0.3
		73.6	3:00	0	0.3
		74.0	4:00	0	0.3
6/16/2004	SG-66-10	122.0	1:00	0	0
		113.0	2:00	0	0
		112.0	3:00	0	0
		111.0	4:00	0	0
6/16/2004	SG-67-10	22.3	2:30	0	0.6
		36.5	6:45	0	0.6
		20.2	0:00	0	0.6
6/16/2004	SG-68-10	12.5	3:25	0	0.8
		9.2	7:15	0	0.8
		7.1	0:00	0	0.6
6/16/2004	SG-69-10	5.3	2:00	0	0.6
		2.3	7:30	0	0.6
		2.4	0:00	0	0.6
6/16/2004	SG-70-10	2.6	2:30	0	0.4
		2.6	8:00	0	0.4
		2.4	0:00	0	0.4

Table 1
Soil-Gas Purging Data
UPRR Phoenix, Arizona
June 2004

Date	Sample Location	PID (ppm)	Time (min:sec)	Vacuum (in)	Ambient (ppm)
6/16/2004	SG-71-10	2.1	2:00	0	0.6
		1.6	7:00	0	0.6
		1.3	0:00	0	0.6
6/17/2004	SG-72-9	0.7	3:00	0	0.1
		0.3	7:15	0	0.1
		0.5	0:00	0	0.1
6/17/2004	SG-73-8.5	0.4	1:45	0	0
		0.1	7:00	0	0
		0.0	0:00	0	0
6/17/2004	SG-74-8.5	0.5	1:30	0	0
		0.1	0:00	0	0
6/17/2004	SG-75-10	1.0	2:00	0	0.2
		0.7	6:00	0	0.2
		0.4	0:00	0	0.2
6/17/2004	SG-76-10	1.4	2:15	0	0.1
		0.5	7:15	0	0.1
		0.4	0:00	0	0.1
6/17/2004	SG-77-10	1.0	1:30	0	0.2
		0.3	7:00	0	0.2
		0.2	0:00	0	0.2
6/17/2004	SG-78-10	0.4	2:45	0	0.2
		0.3	6:40	0	0.2
		0.1	0:00	0	0.2
6/17/2004	SG-79-9.5	0.2	1:00	0	0
		0.1	8:00	0	0
6/17/2004	SG-80-10	0.8	1:30	0	0.2
		0.7	5:00	0	0.2
		0.6	0:00	0	0.2
6/17/2004	SG-81-12.5	0.7	1:20	0	0.2
		0.2	7:00	0	0.2
		0.4	0:00	0	0.2
6/17/2004	SG-82-9	43.6	1:00	0	0.6
		63.8	2:00	0	0.6
		51.4	3:30	0	0.6
		59.5	4:20	0	0.6

Table 1
Soil-Gas Purging Data
UPRR Phoenix, Arizona
June 2004

Date	Sample Location	PID (ppm)	Time (min:sec)	Vacuum (in)	Ambient (ppm)
6/17/2004	SG-83-10	40.8	1:00	0	0.6
		68.1	1:42	0	0.6
		60.7	2:45	0	0.6
		60.9	3:40	0	0.6
6/17/2004	SG-84-10	36.4	1:00	0	0.3
		65.4	1:44	0	0.3
		67.0	2:15	0	0.3
		67.0	3:00	0	0.3
6/28/2004	SG-85-10	0.0	0:30	0	0
		0.6	1:15	0	0
		0.0	2:00	0	0
		0.1	2:50	0	0
6/29/2004	SG-86-10	0.0	1:00	0	0
		12.1	2:00	0	0
		12.1	3:00	0	0
		16.5	4:00	0	0
6/29/2004	SG-87-10	4.6	1:00	0	0
		1.5	2:00	0	0
		0.0	3:15	0	0
		0.9	4:00	0	0
6/29/2004	SG-88-10	61.3	1:00	0	0
		80.8	1:50	0	0
		87.0	2:30	0	0
		85.1	3:30	0	0
6/29/2004	SG-89-10	56.7	1:00	0	0
		60.6	1:45	0	0
		59.6	1:45	0	0
		59.2	3:20	0	0
6/29/2004	SG-90-10	19.7	0:50	0	0
		22.8	1:30	0	0
		23.6	2:15	0	0
		22.1	3:20	0	0
6/29/2004	SG-91-10	0.7	0:50	0	0
		2.4	1:30	0	0
		3.6	2:45	0	0
		1.8	3:30	0	0

Table 1
Soil-Gas Purging Data
UPRR Phoenix, Arizona
June 2004

Date	Sample Location	PID (ppm)	Time (min:sec)	Vacuum (in)	Ambient (ppm)
6/29/2004	SG-92-10	3.9	1:00	0	0
		4.9	2:00	0	0
		3.3	2:40	0	0
		2.3	3:30	0	0
6/29/2004	SG-93-10	0.0	0:45	0	0
		0.0	1:15	0	0
		0.0	2:45	0	0
		0.0	3:20	0	0
6/29/2004	SG-94-10	0.0	0:50	0	0
		0.6	1:30	0	0
		0.0	2:40	0	0
		1.3	3:30	0	0
6/29/2004	SG-95-10	1.8	0:05	0	0
		1.6	1:20	0	0
		0.3	2:10	0	0
		1.5	3:05	0	0
6/29/2004	SG-96-10	2.7	1:00	0	0
		38.7	2:00	0	0
		29.4	2:50	0	0
		14.7	3:50	0	0
6/29/2004	SG-97-10	0.0	0:05	0	0
		6.7	1:50	0	0
		7.6	2:50	0	0
		5.1	3:48	0	0
6/29/2004	SG-98-10	2.2	1:00	0	0
		5.0	2:00	0	0
		5.8	3:00	0	0
		4.6	3:50	0	0
6/29/2004	SG-99-10	0.0	0:45	0	0
		3.1	1:35	0	0
		2.7	2:40	0	0
		2.7	3:40	0	0
6/29/2004	SG-100-10	1.7	1:00	0	0
		4.4	1:50	0	0
		3.6	3:00	0	0
		3.1	3:50	0	0

Table 1
Soil-Gas Purging Data
UPRR Phoenix, Arizona
June 2004

Date	Sample Location	PID (ppm)	Time (min:sec)	Vacuum (in)	Ambient (ppm)
6/29/2004	SG-101-10	3.8	0:50	0	0
		5.1	1:30	0	0
		3.4	2:30	0	0
		3.4	2:30	0	0
6/29/2004	SG-102-10	3.8	0:50	0	0
		5.1	1:30	0	0
		3.4	2:30	0	0
		3.4	3:20	0	0
6/29/2004	SG-103-10	3.0	1:00	0	0
		3.5	1:00	0	0
		3.0	3:00	0	0
		3.1	3:50	0	0

Table 2
Soil-Gas Analytical Data Summary
Mobile (Field) Lab
UPRR Phoenix, Arizona
June 2004

Sample Name	Date	Method	PCE µg/L	TCE µg/L	cis-1,2-DCE µg/L	trans-1,2-DCE µg/L	1,1-DCE µg/L	VC µg/L	1,1-Difluoroethane µg/L
SG-1-9.5	6/9/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-2-10	6/9/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-3-10	6/9/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-4-10	6/9/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-5-10	6/9/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-6-10	6/9/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	**1.7**	< 10 U
SG-7-10	6/9/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-8-10	6/9/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-9-10	6/9/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-10-10	6/10/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-11-10	6/10/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-12-10	6/10/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-13-10	6/10/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-14-10	6/10/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-15-10	6/10/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-16-10	6/10/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-17-10	6/10/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-18-9.5	6/10/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-19-10	6/10/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-20-9	6/11/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-21-10	6/11/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	**2.1**	< 10 U
SG-22-9	6/11/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-23-10	6/11/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-24-10	6/11/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	**1.0**	< 10 U
SG-25-10	6/11/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-26-10	6/11/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-27-10	6/11/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-28-10	6/11/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-29-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-30-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-31-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-32-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U

< # U = undetected at given value

Table 2
Soil-Gas Analytical Data Summary
Mobile (Field) Lab
UPRR Phoenix, Arizona
June 2004

Sample Name	Date	Method	PCE µg/L	TCE µg/L	cis-1,2-DCE µg/L	trans-1,2-DCE µg/L	1,1-DCE µg/L	VC µg/L	1,1-Difluoroethane µg/L
SG-33-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-34-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-35-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-36-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-37-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-38-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-39-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-40-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-41-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-42-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-43-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-44-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-45-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-46-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-47-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-48-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-49-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-50-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-51R-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-52-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-53-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-54-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-55-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-56-10	6/15/2004	SW8260B	< 1 U	< 1 U	**2.3 X 10^3**	< 1 U	**2.5**	**1.2**	< 10 U
SG-57-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-58-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-59-10	6/16/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-60-10	6/16/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	**2.1**	< 10 U
SG-61-9	6/16/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	**1.1**	< 10 U
SG-62-10	6/16/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-63-10	6/16/2004	SW8260B	< 1 U	**1,100**	**2.2**	< 1 U	**2.4**	**1.2**	< 10 U
SG-64-10	6/16/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	**1.1**	< 1 U	< 10 U

< # U = undetected at given value

Table 2
Soil-Gas Analytical Data Summary
Mobile (Field) Lab
UPRR Phoenix, Arizona
June 2004

Sample Name	Date	Method	PCE µg/L	TCE µg/L	cis-1,2-DCE µg/L	trans-1,2-DCE µg/L	1,1-DCE µg/L	VC µg/L	1,1-Difluoroethane µg/L
SG-65-10	6/16/2004	SW8260B	< 1 U	**1.7**	**3.9**	< 1 U	**3.9**	**1.5**	< 10 U
SG-66-10	6/16/2004	SW8260B	< 1 U	**3.5**	**3.4**	< 1 U	**3.3**	**1.4**	< 10 U
SG-67-10	6/16/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-68-10	6/16/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-69-10	6/16/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-70-10	6/16/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-71-10	6/16/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-72-9	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-73-8.5	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-74-8.5	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-75-10	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-76-10	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-77-10	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-78-10	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-79-9.5	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-80-10	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-81-12.5	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-82-10	6/17/2004	SW8260B	< 1 U	**1.5**	**6.9**	< 1 U	**5.8**	**1.4**	< 10 U
SG-83-10	6/17/2004	SW8260B	< 1 U	< 1 U	**4.8**	< 1 U	**5.1**	**1.4**	< 10 U
SG-84-10	6/17/2004	SW8260B	< 1 U	**3.6**	**4.7**	< 1 U	**4.2**	**1.2**	< 10 U
SG-85-10	6/28/2004	SW8260B	< 1 U	**1.7**	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-86-10	6/28/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-87-9	6/28/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-88-10	6/28/2004	SW8260B	< 1 U	**3.5**	**2.9**	< 1 U	**2.5**	**1.1**	< 10 U
SG-89-8.5	6/28/2004	SW8260B	< 1 U	**1.6**	**3.2**	< 1 U	**3.8**	**1.1**	< 10 U
SG-90-10	6/28/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-91-10	6/28/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-92-10	6/29/2004	SW8260B	< 1 U	**3.9**	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-93-10	6/29/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-94-10	6/29/2004	SW8260B	< 1 U	**3.5**	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-95-10	6/29/2004	SW8260B	< 1 U	**3.3**	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-96-10	6/29/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U

< # U = undetected at given value

Table 2
Soil-Gas Analytical Data Summary
Mobile (Field) Lab
UPRR Phoenix, Arizona
June 2004

Sample Name	Date	Method	PCE µg/L	TCE µg/L	cis-1,2-DCE µg/L	trans-1,2-DCE µg/L	1,1-DCE µg/L	VC µg/L	1,1-Difluoroethane µg/L
SG-97-10	6/29/2004	SW8260B	< 1 U	**1.5**	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-98-10	6/29/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-99-10	6/29/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-100-10	6/29/2004	SW8260B	< 1 U	**7.5**	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-101-10	6/29/2004	SW8260B	< 1 U	**4.8**	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-102-7	6/29/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-103-8	6/29/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U

< # U = undetected at given value

Table 3
Soil-Gas Analytical Data Summary - Detections Only
Mobile (Field) Lab
UPRR Phoenix, Arizona
June 2004

Location ID	Sample Type	Sample Name	Date	Method	TCE µg/L	cis-1,2-DCE µg/L	1,1-DCE µg/L	VC µg/L
SG-6-10	N	SG-6-10	6/9/2004	SW8260B				1.7
SG-21-10	N	SG-21-10	6/11/2004	SW8260B				2.1
SG-24-10	N	SG-24-10	6/11/2004	SW8260B				1.0
SG-56-10	N	SG-56-10	6/15/2004	SW8260B		2.3	2.5	1.2
SG-60-10	N	SG-60-10	6/16/2004	SW8260B				2.1
SG-61-9	N	SG-61-9	6/16/2004	SW8260B				1.1
SG-63-10	N	SG-63-10	6/16/2004	SW8260B	1.1	2.2	2.4	1.2
SG-64-10	N	SG-64-10	6/16/2004	SW8260B			1.1	
SG-65-10	N	SG-65-10	6/16/2004	SW8260B	1.7	3.9	3.9	1.5
SG-66-10	N	SG-66-10	6/16/2004	SW8260B	3.5	3.4	3.3	1.4
SG-82-9	N	SG-82-10	6/17/2004	SW8260B	1.5	6.9	5.8	1.4
SG-83-10	N	SG-83-10	6/17/2004	SW8260B		4.8	5.1	1.4
SG-84-10	N	SG-84-10	6/17/2004	SW8260B	3.6	4.7	4.2	1.2
SG-85-10	N	SG-85-10	6/28/2004	SW8260B	1.7			
SG-88-10	N	SG-88-10	6/28/2004	SW8260B	3.5	2.9	2.5	1.1
SG-89-8.5	N	SG-89-8.5	6/28/2004	SW8260B	1.6	3.2	3.8	1.1
SG-92-10	N	SG-92-10	6/29/2004	SW8260B	3.9			
SG-94-10	N	SG-94-10	6/29/2004	SW8260B	3.5			
SG-95-10	N	SG-95-10	6/29/2004	SW8260B	3.3			
SG-97-10	N	SG-97-10	6/29/2004	SW8260B	1.5			
SG-100-10	N	SG-100-10	6/29/2004	SW8260B	7.5			
SG-101-10	N	SG-101-10	6/29/2004	SW8260B	4.8			

Blank cells indicate compound was not detected.

Table 4
Soil-Gas Analytical Data Summary
QA/QC Samples - Duplicate Analyses
UPRR Phoenix, Arizona
June 2004

Location ID	Sample Type	Sample Name	Date	Method	PCE µg/L	TCE µg/L	cis-1,2-DCE µg/L	trans-1,2-DCE µg/L	1,1-DCE µg/L	VC µg/L	1,1-Difluoroethane µg/L
SG-8-10	N	SG-8-10	6/9/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-8-10	FD	SG-8-10-8260D	6/9/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-10-10	N	SG-10-10	6/10/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-10-10	FD	SG-10-10-8260D	6/10/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-10-10	FD	SG-10-10-TO15D	6/10/2004	TO15	0.0050	< 0.0028 U	< 0.0020 U	< 0.0020 U	< 0.0020 U	< 0.0013 U	
SG-17-10	N	SG-17-10	6/10/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-17-10	FD	SG-17-10-8260D	6/10/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-17-10	FD	SG-17-10-TO15D	6/10/2004	TO15	< 0.069 U	< 0.055 U	< 0.040 U	< 0.040 U	< 0.040 U	< 0.026 U	
SG-26-10	N	SG-26-10	6/11/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-26-10	FD	SG-26-10-8260D	6/11/2004	SW8260B	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U
SG-26-10	FD	SG-26-10-TO15D	6/11/2004	TO15	0.10	0.19	0.17	< 0.040 U	< 0.040 U	0.91	
SG-30-10	N	SG-30-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-30-10	FD	SG-30-10-8260D	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-30-10	FD	SG-30-10-T015D	6/14/2004	TO15	< 0.14 U	< 0.11 U	< 0.080 U	< 0.080 U	< 0.081 U	0.24	
SG-42-10	N	SG-42-10	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-42-10	FD	SG-42-10-8260D	6/14/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-42-10	FD	SG-42-10-T015D	6/14/2004	TO15	< 0.0034 U	< 0.0028 U	< 0.0020 U	< 0.0020 U	< 0.0020 U	< 0.0013 U	
SG-54-10	N	SG-54-10	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-54-10	FD	SG-54-10-8260D	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-54-10	FD	SG-54-10-TO15D	6/15/2004	TO15	< 0.069 U	< 0.055 U	< 0.040 U	< 0.040 U	< 0.040 U	< 0.026 U	
SG-64-10	N	SG-64-10	6/16/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	1.1	< 1 U	< 10 U
SG-64-10	FD	SG-64-10-8260D	6/16/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-64-10	FD	SG-64-10-TO15D	6/16/2004	TO15	< 0.14 U	0.12	0.72	< 0.080 U	1.1	0.52	
				RPD					0.0		

< # U = undetected at given value
8260B samples were analyzed with mobile lab
TO15 samples were analyzed at fixed lab

Table 4
Soil-Gas Analytical Data Summary
QA/QC Samples - Duplicate Analyses
UPRR Phoenix, Arizona
June 2004

Location ID	Sample Type	Sample Name	Date	Method	PCE µg/L	TCE µg/L	cis-1,2-DCE µg/L	trans-1,2-DCE µg/L	1,1-DCE µg/L	VC µg/L	1,1-Difluoroethane µg/L
SG-78-10	N	SG-78-10	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-78-10	FD	SG-78-10-8260D	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-78-10	FD	SG-78-10-TO15D	6/17/2004	TO15	0.012	< 0.0055 U	< 0.0040 U	< 0.0040 U	< 0.0040 U	< 0.0026 U	
SG-80-10	N	SG-80-10	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-80-10	FD	SG-80-10-8260D	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-80-10	FD	SG-80-10-TO15D	6/17/2004	TO15	0.38	0.013	< 0.0040 U	< 0.0040 U	< 0.0040 U	< 0.0026 U	
SG-82-9	N	SG-82-10	6/17/2004	SW8260B	< 1 U	1.5	6.9	< 1 U	5.8	1.4	< 10 U
SG-82-9	FD	SG-82-9-TO15D	6/17/2004	TO15	< 0.14 U	0.72	3.8	< 0.080 U	2.8	0.57	
				RPD		70.3	57.9		69.8	84.3	
SG-89-8.5	N	SG-89-8.5	6/28/2004	SW8260B	< 1 U	1.6	3.2	< 1 U	3.8	1.1	< 10 U
SG-89-8.5	FD	SG-89-8.5-8260D	6/28/2004	SW8260B	< 1 U	1.3	2.7	< 1 U	3.4	1.0	< 10 U
SG-89-8.5	FD	SG-89-8.5-TO15D	6/28/2004	TO15	0.076	0.94	1.8	< 0.040 U	1.9	0.49	
				RPD		20.7	16.9		11.1	9.5	
				RPD		74.0	72.0		66.7	61.6	
SG-94-10	N	SG-94-10	6/29/2004	SW8260B	< 1 U	3.5	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
SG-94-10	FD	SG-94-10-8260D	6/29/2004	SW8260B	< 1 U	2.9	< 1 U	< 1 U	< 1 U	<.1 U	< 10 U
SG-94-10	FD	SG-94-10-TO15D	6/29/2004	TO15	0.16	5.3	< 0.040 U	< 0.040 U	0.052	< 0.026 U	
				RPD		18.8					
				RPD		120.5					

< # U = undetected at given value
8260B samples were analyzed with mobile lab
TO15 samples were analyzed at fixed lab

Table 5
Soil Gas Analytical Data Summary
QA/QC Samples - Field Equipment Blanks
UPRR Phoenix, Arizona
June 2004

Location ID	Sample Type	Sample Name	Date	Method	PCE µg/L	TCE µg/L	cis-1,2-DCE µg/L	trans-1,2-DCE µg/L	1,1-DCE µg/L	VC µg/L	1,1-Difluoroethane µg/L
FieldQC	EB	SG-FEB1	6/9/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	74
FieldQC	EB	SG-FEB2	6/15/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
FieldQC	EB	SG-FEB3	6/16/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
FieldQC	EB	SG-FEB4	6/17/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U
FieldQC	EB	SG-FEB5	6/28/2004	SW8260B	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 10 U

< # U = undetected at given value

Soil Concentration Calculations
From Soil-Gas Sampling Results
UPRR Phoenix, Arizona
June 2004

Variable	Definition	Units	Value
C_t	total soil concentration	µg/kg	
C_v	total soil-vapor concentraion	µg/L	
K_d	soil-water partioning distribution coefficient (Koc)(foc)	L/kg	
P_b	bulk density	kg/L	1.7
K_H	Henry's Law constant	atm-m^3 / mol	
K'_H	Henry's Law constant (K_H / RT)	dimensionless	
θ_w	volumetric water content	dimensionless	0.045
θ_T	total porosity	dimensionless	0.5
K_{oc}	organic carbon partition coefficient	L/kg	
f_{oc}	fraction organic carbon	dimensionless	0.0012
R	gas constant	L-atm/K-mol	0.082057
T	temperature (20 °C)	Kelvin	293.15

Variable	TCE	1,1-DCE	cis-1,2-DCE	VC
K_H	0.020	0.19	0.0017	0.695
K'_H	0.000831	0.007899	0.0000707	0.028892
K_{oc}	221	65	49	98
K_d	0.2652	0.078	0.0588	0.1176

	TCE	1,1-DCE	cis-1,2-DCE	VC	
C_V	7.5	5.8	6.9	2.1	highest concentrations from June 2004 investigation

	TCE	1,1-DCE	cis-1,2-DCE	VC	
C_T (µg/kg)	2633	78	8327	11	This is where the calculation is made

Arizona Soil Remediation Levels						
	Residential	27000	360	31000	16	µg/kg
	Industrial	70000	800	100000	35	µg/kg

SRLs from Arizona Administrative Code, Title 18, Chapter 7, Article 2, Appendix A (non-residential)

APPENDIX D
FIELD NOTES

Phoenix 6/8/04

6:00 Arrive on site
Lab here (RUSS) DAN DOWERS,
SCOTT JOHNSON (rig)

6:15 Safety Briefing

6:30 Problems with LAB.

7:00 WAYNE (ACE) Arrives

7:15 RYAN POWERS (Shaw) Arrives 602-697-7474

7:40 WAYNE LEAVES

10:30 Lab can't be fixed today will send out part and new lab everyone leaves site.

TODD MAYES

UPRR ~~Tues~~ Wednesday

6/9/04 Phoenix Todd E. Brauer

6:00 Arrive on site.
Scotty, Dan, Russ, Josh (new lab)
New lab on site

6:15 Safety briefing

6:25 Move to SG-1

7:00 Leak check system. Less than ½" vacuum loss in 1 min @ 17"

7:28 Began SG-1
~~38° 56.218 N~~ 33° 26.551 N
~~94° 45.668 W~~ 112° 03 17.5 W

7:00 DPH SG-1-9.5 auger refusal 2' into cobble layer

7:57 Begin SG-1 Purge 0 vacuum

8:02 PID 0.0

8:08 SG-1-9.5 @ 8:08 Sampled
taken to lab PID 0.0
Purged 10 minutes @ 500 ml/min

~~Tues~~ Wed

UPRR

Todd E. Brauer 6/9/04 Phoenix

8:23 Began Drilling SG-2

8:35 hole caved in moved E 1 ft start again.

8:58 Start purge on SG-2-10
PID 4.5 ppm @ 1:30 min
0" Vacuum
~~38° 56.218 N~~ 33° 26.550 N
~~94° 45.668 W~~ 112° 03.193 W
6.3 ppm @ 5.00 purge
6.2 ppm @ 7:15

9:08 Sampled SG-2-10 @ 9:08
6.5 ppm @ 10:00

9:23 Begin SG-3

9:40 Begin Purge
0" vacuum
0.0 ppm @ 2:40
~~38° 56.218 N~~ 33° 26.550 N
~~94° 45.669 W~~ 112° 03.212 W

9:50 Sampled SG-3-10
0.00 ppm

~~Tues~~ Wed

6/9/04 UPRR Phoenix Todd E. Manner

10:10 Begin Drilling SG-4

10:26 begin Purge SG-4-10
0" Vacuum
33° 26.543 N
112° 03.236 W
0.8 ppm @ 2:22
1.2 ppm @ 6:00

10:40 Sample SG-4-10
1.1 ppm

End of vapor tube black with subsurface substance. Changing tubing

11:00 SG-5 Begin drilling

11:17 Auger refusal @ 6' SG-5
moved 14' NE

11:24 SG-5 Begin again

11:38 Began SG-5 Purge
1.0 ppm @ 2:30

~~Tues~~ Wed

Todd E Manner UPRR Phoenix 6/9/04

33° 26.546 N
112° 03.246 W

11:50 Sample SG-5-10
1.2 ppm

12:05 Begin SG-6

12:23 Begin SG-6-10 Purge
0.0 @ 1:00 0" vacuum
33° 26.645 N
112° 03.246 W
0.0 @ 6:00

12:35 Sample SG-6-10
0.0 ppm

12:45 Begin drill SG-7 33° 26.552 N
112° 03.235 W

13:00 Begin Purge SG-7-10
0.0 ppm @ 1:00 0" vacuum

13:10 Sample SG-7-10
0.0 ppm @ 10:00

Wed

6/9/04 UCR Phoenix Todd E Mansor

13:35 ~~@ SG-FEB1~~
SG-FEB1
Wrapped Leak check way around probe tip with DT

13:40 Begin Drill SG-8

13:52 Begin purge SG-8-10
2.5 ppm @ 4:00 0" vacuum
33° 26.533 N
112° 03.285 W
2.0 ppm @ 8:45

1405 Sample SG-8-10
1406 SG-8-10-8260D
1415 SG-8-10-7015D

1432 Begin SG-9

1445 Begin Purge SG-9-10
1.6 ppm @ 5:00 0" Vacuum
33° 26.532 N
112° 03.295 W
1.5 ppm @ 8:30

Wed

UCR Phoenix 6-9-04

1459 Sample SG-9-10
1.5 ppm

Pre-drilled SG-10,11 to 3'

1645 Left site

DHW Powers Trk 7015
Sample to Norotech

Todd E Mansor

Thurs

6/10/04 UPRR Phoenix Todd E. Hoover

5:00 Arrive on site
5:15 Safety meeting
drilling setup
6:18 Begin SG-10

6:25 Begin Purge SG-10-10
0" vacuum
33° 26.548 N
112° 03.305 W

6:34 Sample SG-10-10
0.4 ppm (Zero) @ 2:00
0.4 ppm @ 10:00
6:37 Take SG-10-10-8260 D

6:38 Take SG-10-10-TO15D

6:59 Begin drilling SG-11

7:10 Begin purge SG-11-10
0" vacuum
1.6 ppm @ 1:00 2.0 ppm @ 6:00
33° 26.546 N
112° 03.290 W

Thurs

Todd E. Hoover - UPRR Phoenix 6/10/04

7:20 Sampled SG-10-10
1.6 ppm

7:36 Begin drilling SG-12

8:00 Begin Purge SG-12-10
0" vac
33° 26.547 N
112° 03.274 W
11 ppm @ 2:40 13.2 ppm @ 4:00

8:10 Sampled SG-12-10
15.2 ppm

8:20 Begin drilling SG-13

8:37 Begin Purge SG-13-10
0" vac 12.5 ppm @ 2:45
33° 26.548 N
112° 03.268 W
13.5 ppm @ 6:45

Thurs

6/10/04 UPAR Phoenix Zadd E. Thomas

8:47 SG-13-~~15~~ 10 sampled
13.5 ppm

9:05 Begin drilling SG-14
hit concrete @ 2.5'
moving 2' East

9:02 Restart SG-14

9:29 Begin Purge SG-14-10
0" vac
10.8 ppm @ 2:00
33°.26.563 N
112° 03.268 W
10.0 ppm @ 4:00

9:39 Sampled SG-14-10
3.0 ppm

9:58 Begin Drill SG-15
Concrete @ 1'
using concrete corer

Thurs

Zadd E. Thomas UPAR Phoenix 6/[illegible]

10:33 Begin Purge SG-15-10
0" vac 11.2 ppm @ 2:00
33° 26.565 N
112° 03.287 W
15.1 ppm @ 4.00

10:43 Sample SG-15-10
18.1 ppm

10:57 Begin drill SG-16
Cored Concrete
Bent rod @ 5'
moving ~~7~~ 2' East
2' South

12:21 Begin Purge SG-16-10
33° 26.562 N
112° 03.296 W
0" vac 13.8 ppm @ 2:15
13.3 ppm @ 5:15

12:31 Sample SG-16-10
13.2 ppm

Thurs

6/10/04 UPRR Phoenix Todd E Manes

1325 Begin drill SG-17
1335 Begin Purge SG-17-10
0" VAC 5.7 ppm @ 3:00
4.3 ppm @ 6:30
33° 26.558 N
112° 03.313 W

1345 Sampled SG-17-10
4.7 ppm

~~1346 Sampled SG-17-10-82600~~

1347 Sampled SG-17-10-TO15
1354 Sampled SG-17-10-8260
1520 Began drilling SG-18

1533 Begin Purging SG-18-9.5
8.5 ppm @ 1:00
0" VAC
33° 26.573 N
112 03.294 W
130 @ 6:00

Thurs

UPRR Phoenix 6/10/04

15:44 Sampled SG-18-9.5
13.4 ppm

15:50 Begin SG-19 drilling

16:10 Begin Purge SG-19-10
0" vac 10.2 @ 2:00
33° 26.575 N
112° 03.310 W
9.7 ppm @ 8:30

16:20 Sampled SG-19-10

17:00 Leave site
Russ took TO15 Samples to Aerotech

Todd E Manes

Pg 1

6/14/04 UPRR Phoenix Todd E. Brauer

5:00 Arrive on site

5:30 Safety meeting

6:15 begin drilling SG-20
auger refusal @ 2'
moved w 3'
hit concrete again
moved 5' E and 10' S
hit concrete again
Going back to original spot
and using drill

7:43 Begin Purge SG-20-9
0" vac
4.8 ppm @ 1:50
33° 26.572N
112° 03.280W
5.2 ppm @ 5:00

7:53 Sampled SG-20-9
2.9 ppm

Pg 2

Todd E. Brauer - UPRR Phoenix 6/14/04

8:10 begin SG-21 drilling

8:43 begin purge SG-21-10
0" vac 33° 26.575N
10.7 ppm @ 1:00 112° 03.269W

8:53 Sample SG-21-10
11.4 ppm

9:14 Begin drilling SG-22-10

9:34 Begin purge SG-22-9
0" vac 5.5 ppm @ 1:45
33° 26.521N
112° 03.258W
3.3 ppm @ 8:57

9:44 Sampled SG-22-9

9:55 Begin SG-23
2 holes - refusal @ 1ft
Rock on top of stone SG-23
on map

Fr[illegible]

~~6/7/04~~ VPRR Phoenix 2nd E Travis

10:19 start 3rd attempt @ SG-23

4th attempt w/ drill

11:02 Begin Purge SG-23-10
0" vac 33° 26.528 N
112° 03.249 W
0.6 ppm @ 4:30 ambient is
0.6 ppm @ 7:00 0.4 ppm

11:12 Sampled SG-23-10
0.4 ppm

11:38 Began drilling SG-24~~0~~
moved ≈ 4' west because of
buried electrical lines

11:47 Begin Purging SG-24-10
0" vac 33° 26.527 N
112° 03.273 W
9.4 ppm @ 1:00 0.9 ppm ambient
15.3 ppm @ 7:30

Fr[illegible]

2nd E Travis - VPRR Phoenix 6/14/04

11:57 Sampled SG-24-10
16.2 ppm

12:10 Begin drilling SG-25
hit concrete
cored to 18"
Lunch Break

13:30 Begin purge SG-25-10
0" vac 33° 26.595 N
112° 03.282 W
11.8 ppm @ 2:15
12.7 ppm @ 8:30

13:40 Sampled SG-25-10
12.8 ppm

13:58 Begin drilling SG-26

14:06 Begin purging SG-26-10
0" vac 33° 26.592 N 0.4 AMB
112° 03.297 W
9.0 @ 2:00
10.7 7:00

~~14:10 Sampled~~

6/11/04 VPRR Phoenix Todd E. Mower

14:16 SAMPLED SG-26-10
10.7 PPM

14:17 SAMPLED SG-26-10-82000

14:18 SAMPLED SG-26-10-TD15D

14:45 begin drilling SG-27
used concrete core. Completed

15:15 Begin Purging SG-27
0" VAC 1.6 ppm @ 2:24 0.7 Amb
33° 26.693N
112° 03.309W
0.1 ppm @ 8:30

15:25 Sampled SG-27-10
0.0 ppm

15:40 Begin SG-28 drilling
15:48 Begin Purging SG-28-10
0" VAC 0.0 ppm @ 3:00 Amb 0.6
33° 26.682N
112° 03.307W
0.0 ppm @ 6:15

VPRR Phoenix 6/11/04

15:58 Sampled SG-28-10
0.0 ppm

16:38 Left Site - take TD-15 Sample to
Todd E. Mower - Received

MON

6/14/04 UPRR Phoenix Todd E Turner

5:00 Arrive on site, calibrate PID
6:03 Begin drilling SG-29
6:12 Begin purge SG-29-10
0" Vac 0.6 ppm @ 1:45 0.0 ambient
33° 26.600 N
112° 03.295 W

6:22 Sampled SG-29-10
0.0 ppm

6:45 Begin Drilling SG-30-10
6:50 Begin Purge SG-30-10
6 0" VAC 3.9 ppm @ 4:00 0.0 amb
33° 26.604 N
112° 03.273 W

7:00 Sampled SG-30-10

7:01 Sampled SG-30-10-82600

7:03 Sampled SG-30-10-Todd

MON

Todd E Turner UPRR Phoenix 6/14/04

7:30 Begin drill SG-31
7:36 Begin Purge SG-31-10
0" Vac 8.9 ppm @ 1:30 0.0 amb
33° 26.690 N
112° 03. 229 W
6.8 ppm @ 6:45

7:46 Sampled SG-31-10
3.2 ppm

8:07 Begin drilling SG-32-10 (near Switchmis
starts @ 16th St)

8:18 Begin Purge SG-32-10
0" VAC 4.3 ppm @ 1:00
33° 26.637 N
112° 02.924 W
1.2 ppm @ 7:00 min

8:28 Sampled SG-32-10
1.0 ppm @

8:57 Begin drilling SG-33

MoW

6/14/04 UPRR Phoenix ~~Todd E. Brewer~~

9:06 Begin Purging SG-33-10
0" vac 1.3 ppm @ 1:30 0.0 amb
33° 26.601N 112° 03.498W 0.8ppm @ 6:30

9:16 Sampled SG-33-10
0.2 ppm

9:27 Began drilling SG-34

9:37 Began Purge SG-34-10
0" vac 0.7ppm @ 1:00 0.0 ppm Amb
33° 26.590N
112° 03.490W
0.3 ppm @ 7:45

9:47 Sampled SG-34-10
0.2 ppm

10:02 Begin drilling SG-35

10:08 Begin Purge of SG-35-10
0" vac 0.9 ppm @ 1:00 0.0 Amb
33° 26.584 N
112° 03.490 W 0.1 ppm @ 8:45

10:18 Sampled SG-35-10
~~0.1~~ 0.1 ppm

MoW

Todd E. Brewer UPRR Phoenix 6/14/04

10:34 Begin drilling SG-36

10:45 Begin purging SG-36-10
0" vac 0.5ppm @ 1:00 0.0 amb
33° 26.590N
112° 03.500W
0.3 ppm @ 6:30

10:55 Sampled SG-36-10
0.3 ppm

11:05 Met with Jerry of Utility Location to Locate borings North of tracks by yard office plus background

11:20 Began drilling SG-37 with DPC
concrete at surface moved SW 3'
auger refusal @ 7.5'
moved

11:50 Begin Drilling SG-37-10

12:00 Begin Purge SG-37-10
0" VAC 1.5 ppm @ 1:00 min 0.1 amb
1.0 ppm @ 4:00
~~12:10~~ 33° 26.587 N
112° 03.510W

12:10 Sampled SG-37-10
0.5 ppm

Max

6/14/04 USA Phoenix Todd E Thomas

~~6/14/04~~ 12:56 Begin drilling SG-38

13:10 Begin Purging SG-38-10
0" Vac 0.7ppm @ 1130 0.4 ppm Amb
33° 26.593N
112° 03.510W
0.6 ppm @ 5:30

13:20 Sampled SG-38-10
0.3 ppm

13:30 Begin Drilling SG-39

13:43 Begin Purging SG-39-10
0" Vac 0.6ppm @ 2:45 0.2ppm Amb
33 26.590N
112 03.510W
0.3ppm @ 8:00

13:53 Sampled SG-39-10
0.2 ppm

14:04 Began drilling SG-40

Max

Todd E Thomas USA Phoenix 6/14/04

14:15 Begin Purging SG-40-10
0" Vac 0.2ppm amb
33° 26.602N
112° 03.556W
0.6ppm @ 6:15

14:25 Sampled SG-40-10
0.5 ppm

14:49 Began drilling SG-41-

14:58 Begin purge SG-41-10
0" vac 0.4 ppm @ 2:00 0.2 amb
33° 26.596N
112° 03.564W
.6 ppm

15:08 Sampled SG-41-10
0.3 ppm

15:16 Begin drilling SG-42

15:28 Begin Purging SG-42-10
0" vac 0.5ppm @ 2:00 0.1 amb
33° 26.588N
112° 03.569W
0.5 ppm @ Cal 30

MON

6/14/04 UPRR Phoenix

15:38 Sampled SG-42-10
0.3 ppm.

15:39 Sampled SG-42-6-82600

15:41 Sampled SG-42-10-TO15D

15:57 Begin drilling SG-43
8" VAC 9.8 ppm @ 2:23 0.1 ppm Amb
33° 26.595 N
112° 03.577 W
13.7 ppm @ 8:00

16:07 Sampled SG-43-10
16.8 ppm

16:45 Leave site for Aerotech

Todd E Mowrer

TUES

Todd E Mowrer UPRR Phoenix 6/15/04

5:00 Arrived

5:30 Safety meeting

5:59 Begin drilling SG-44

6:07 Begin Purging SG-44-10
0" VAC 2.7 ppm @ 2:30 0.3 ppm
33° 26.69 N
112° 03.596 W
18.6 ppm @ 8:00

6:17 Sampled SG-44-10
1.6 ppm @

6:32 Begin drilling SG-45

6:43 Begin Purging SG-45-10
0" VAC 0.7 ppm @ 3:30
33° 26.601 N
112° 03.587 W
0.7 ppm @ 7:45

6:53 Sampled SG-45-10
0.6 ppm

TIMES

6/15/04 UPRR Phoenix Lodd & Treweek

7:01 Begin drilling SG-46

7:10 Begin Purge SG-46-10
0" VAC PID 2.0 ppm 1:45 6.3 ppm am
33 26.858 N
112 03.591 W
1.0 ppm @ 6:00

7:20 Sampled SG-46-10
PID 1.0 ppm

7:35 Begin Drilling SG-47

7:43 Begin purging SG-47-10
0" Vac 33°26.603 N 0.0 ppm
112° 03.640W
2.4 ppm 1:30
1.6 ppm @ 6:30

7:53 Sampled SG-47-10
1.0 ppm

TIMES

Lodd & Treweek UPRR Phoenix 6/15/04

8:18 begin drilling SG-48 N of tracks
John Robles & Eric, Bob Gonzales near yard office

8:23 Began purging SG-48-10 0.2 ppm amb
0" vac 2.6 ppm @ 5:00
33° 26.617 N
112° 03.264 W
2.4 ppm @ 7:15

8:33 sampled SG-48-10
2.6 ppm

8:50 began drilling SG-49

8:56 began purging SG-49-10
0" vac 5.3 ppm @ 2:45 0.0 ppm amb
33° 26.614 N
112° 03.284 W 2.1 ppm @ 7:00

9:06 sampled SG-49-10

9:13 took FEB-2 & old tubing and air charged tubing
Lab reports lab check compounds in
44, 47, 48

TKES

6/15/04 UPRR Phoenix Todd E. Hanson

9:28 Begin drilling SG-50

9:32 Begin purging SG-50-10
0" Vac 2.6 ppm @ 1:45 0.0 Amb
33° 26.616 N
112° 03.299 W
2.3 ppm @ 8:00

9:42 Sampled SG-50-10
2.6 ppm

9:56 Began drilling SG-51

10:03 Begin purging SG-51-10
0" Vac 1.2 ppm @ 2:30 0.0 amb
33° 26.617 N
112° 03.298 W
0.8 ppm @ 6:00

10:13 Sampled SG-51-10
0.9 ppm

10:24 Begin drilling SG-52

TKES

Todd E. Hanson - UPRR Phoenix 6/15/04

10:30 Begin purging SG-52-10
0" Vac 0.3 ppm @ 1:00 0.1 amb
33 26.617 N 112 03.273 W
0.5 ppm @ 6:00

10:40 Sample SG-52-10
0.4 ppm

11:00 Lunch

10:30 Discussion with Lab Engr. Heath
check list @ 51
mv't to 53

12:00 Begin drill SG-53

12:09 Begin purge SG-53-10
3.5" Vac 1.6 ppm @ 2:30 0.2 Amb
33° 26.598 N
112° 03.140 W
0.7 ppm @ 8:00

12:18 Sample SG-53-10
0.7 ppm

TUES

6/15/04 UPRR Phoenix Todd E Turner

12:27 begin drill SG-54
mike widup & Jack Collins BICs

12:37 Begin purge SG-54-10 0.2 ppm amb
0" vac 12.5 @ 2:00
33° 26.596 N
112° 03.118 W
26.4 ppm @ 5:45

12:47 Sampled SG-54-10 23.1 ppm

12:48 Sampled SG-54-10-8260D

12:51 Sampled SG-54-10-TO15

13:05 Begin drilling SG-55

13:17 begin Purge SG-55-10
0" vac 36.2 ppm @ 4:44 0.3 ppm
33° 26.602 N
112° 03.098 W
35.0 ppm @ 6:15

13:27 Sampled SG-55-10
39.2 ppm

TUES

Todd E Turner UPRR Phoenix 6/15/04

13:50 Began drilling SG-51R
located 2' E of SG-51

13:57 Begin purging SG-51R-10
0" vac 5.7 ppm @ 4:00 0.2 ppm amb
33° 26.625 N
112° 03.289 W

14:33 Beg. drilling SG-56

14:40 begin purging SG-56-10
0" vac 41.9 @ 2:45 0.4 ppm amb
33° 26.591 N
112° 03.092 W
47.2 ppm @ 7:30

14:50 Sample SG-56-10
51.6 ppm

15:26 Began ~~Sampling~~ drilling SG-57

15:32 Began purging SG-57 0.5 amb
0.5" vac 33° 26.585 N
112° 03.104 W
14.4 ppm @ 13.15
7.6 ppm @ 7:00

TUES

6 16/15/04 UPRR Phoenix

15:42 Sampled SG-57-10
4.4 ppm

15:55 begin drilling SG-58

16:00 Began purging SG-58-10
0" Vac 7.1 ppm CO/S 0.4
3326.589 N
— 112 03.134 W 4.5 ppm @ 6:00

16:10 Sampled SG-58-10
4.4 ppm

16:40 Take TO-15 samples to Aerotech

Todd E Ronner

Wed

Todd E Ronner UPRR Phoenix 6/16/04

5:00 Arrive on site
5:15 Calibrate PID
5:45 Leak check - change fitting
6:00 Safety meeting

6:34 Begin drilling SG-59 (northernmost coco panels area)

6:45 Begin Purging SG-59-10
0" Vac 2.2 ppm @ 3:30 0.3 ppm and
33° 26.591 N
112 03.154 W
4.5 ppm @ 8:10

6:55 Sampled SG-59-10
1.1 ppm

7:04 Began drilling SG-60

7:25 Began Purging SG-60-10
0" Vac 13.1 ppm @ 3:00 0.0 and
33° 26.584 N
112° 03.273 W
16.1 ppm @ 8:15

Wad

6/16/04 UPRR Phoenix Todd E. Inman

7:35 Sampled SG-60-10
16.7 ppm

7:45 Began drilling SG-60
Concrete Drills

8:34 Beg purging SG-60-9 0.3 ppm amb
20.1 @ 1:15
0" Vac 12.2 ppm @ 6:30
33° 26. 584N
112° 03. 292W

8:44 Sampled SG-60-9
16.1 ppm

8:52 Began SG-62
Started with concrete coring for top 2 feet to get through road base

9:15 Began Purging SG-62-10
0" Vac 5.9 ppm @ 1:30 0.5 ppm Amb
33° 26. 585N
112° 03. 303W
6.3 ppm @ 6:45

Wad

Todd E. Inman UPRR Phoenix 6/16/04

9:25 Sampled SG-62-60
6.4 ppm

9:49 Began SG-63 located 20 east of SG-56

10:02 Began purging SG-63-60 min
Synagage
33.9 ppm @ 1:29 1st 60
42.2 ppm @ 2:36 2nd 60
40.0 ppm @ 3:43 3rd 60
40.4 ppm @ 5:00 4th 60

10:07 Sampled SG-63-10

10:13 Began drilling SG-64
20' N of SG-56
Dal Rail-Elc

10:19 Begin purging SG-64-10
111.0 ppm @ 1:00 1st 60 Amb = 0.4 ppm
17.3 ppm @ 2:00 2nd 60
18.7 ppm @ 3:00 3rd 60
21.7 ppm @ 4:00 4th 60

Wed

6/16/04 UPRR Phoenix Todd E. Reeves

09:24 Sampled SG-64-10

10:30 Sampled SG-64-10-~~8660~~

10:32 Sampled SG-64-10-T0150

10:48 Begin drilling SG-65
18' S of SG-56

10:58 Begin purge SG-65-10
0.3 amb
29.9 ppm @ 1:00 1st 60
73.1 ppm @ 2:00 2nd 60
73.6 ppm @ 3:00 3rd 60
74 ppm @ 4:00 4th 60

11:20 Began Drilling SG-66
20' east of SG-65

11:28 Begin purge SG-66-10
0.0 ppm amb
122.0 ppm @ 1:00 1st 60
130 ppm @ 2:00 2nd 60
112.0 ppm @ 3:00 3rd 60
111.0 ppm @ 4:00 4th 60

Wed

Todd E. Reeves UPRR Phoenix 6/16/04

11:34 Sampled SG-66-10

11:52 Sampled FEB-3

13:41 Begin drilling SG-67 (MOS w compound)
Auger refusal @ 1.5'
new hole 2' south of original

13:57 Begin purging SG-67-10
0" Vac 22.3 ppm @ 2:30 0.6 amb
33° 26.606 W
112° 03.595 W
36.5 ppm @ 6:45

14:07 Sampled SG-67-10
20.2 ppm

14:23 Begin drilling SG-68

14:29 begin purging SG-68-10 0.8 ppm Amb
0" Vac 12.5 @ 3:25
33° 26.597 N
112° 03.606 W
9.2 ppm @ 7:15

Wed

6/16/04 UPRR Phoenix Todd & Reuter

14:39 Sampled SG-68-10
7.1 ppm

14:47 Begin drilling SG-69

14:54 Begin Purging SG-69-10
0" vac 5.3ppm @ 2:00 0.6ppm amb
33° 26.606N
112° 03.609W
2.6 ppm @ 7:38

15:04 Sampled SG-69-0
2.4 ppm @

15:16 Began drilling SG-70

15:23 Begin purging SG-70
0" vac 2.6 ppm @ 2:30 0.4 Amb
33° 26.602N
112° 03.620W
2.6 ppm @ 8:00

15:33 Sampled SG-70-10
2.4 ppm

15:57 Begin drilling SG-71
hit Concrete @ 6" in 3 holes
moved to W side of septic tank

Wed

UPRR Phoenix 6/16/04

16:20 Begin Purging SG-71-10
0" vac 33° 26.630N 0.6 amb
112° 03.717W
2.1 ppm @ 2:00
1.6 ppm @ 7:00

16:30 Sample SG-71-10
1.3 ppm

17:05 Leave for Daratech with
TO-15 sample

Todd & Reuter

Thurs

6/17/04 UPRR Phoenix Todd E. Thomas

5:20 Arr. at on site
5:30 ~~cal~~ calibrated PID
6:00 Safety
6:13 Begin drilling SG-72 in retention pond

6:15 Begin purging SG-72-9
0" Vac 0.7 ppm @ 3:00 0.1 amb
33° 26.293 N
112° 03.605 W
0.3 ppm @ 7:15

6:25 Sampled SG-72-9
0.5 ppm

6:33 Began drilling SG-73

6:43 Begin purging SG-73-8.5
0" Vac 0.4 ppm @ 1:45 0.0 amb
33° 26.295 N
112° 03.606 W
0.1 ppm @ 7:00

6:53 Sampled SG-73-8.5
0.0 ppm

Thurs

Todd E. Thomas - UPRR Phoenix 6/17/04

7:03 Beg. drilling SG-74-8.5 middle of retention Pond.

7:10 Begin Purge SG-74-8.5 0.0 amb
0" VAC .5 ppm @ 1:30
33° 26.290 N
112° 03.606 W

7:20 Sampled SG 74-8.5
.1 ppm

8:10 began drilling SG-75

8:19 began purging SG-75-10
0" Vac 1.0 ppm @ 2:00 0.2 ppm amb
33° 26.323 N
112 03.529 W
0.7 ppm @ 6:00

8:29 Sampled SG-75-10 Truck wash area
~~0.7~~ 0.4 ppm

8:43 began drilling SG-76
reinforced Asphalt 13" thick
used concrete corer

4hours

6/17/04 UPRR Phoenix Todd E Thomas

&

9:14 Begin Purge SG-76-10
0" vac 1.4 ppm @ 2:15 0.1 amb
33° 26.398N
112° 03.469W
0.5 ppm @ 7:15

9:24 Sampled SG-76-10
0.4 ppm

Mini Summa 350 ml canister
2 min fill time

10:05 Begin Drilling SG-77-10

10:13 Begin Purge SG-77-10
0" VAC 1.0 ppm @ 1:30 .2 amb
33° 26.427 N
112° 03.469 W 0.3 ppm @ 7:00

10:23 Sampled SG-77-10
0.2 ppm @

4hrs

Todd E Thomas - UPRR Phoenix 6/17/04

10:48 Begin drilling SG-78 (Historical Impoundment)

10:54 Begin purging SG-78-10
0" vac 0.4 ppm @ 2:05 0.2 amb
33° 26.479N
112° 03.376W
0.3 ppm @ 6:40

11:04 Sampled SG-78-10 0.1 ppm

11:05 Sampled SG-78-10-82600

11:07 Sampled SG-78-10-TOLD

11:20 Begin drilling SG-79-

11:32 Begin purging SG-79-9.5
0" vac 0.2 ppm @ 1:00 0.0 amb
33° 26.501N
112° 03.379W
0.1 ppm @ 8:00

11:42 Sampled SG-79-9.5

Thurs

6/17/04 UP RR Phoenix Todd E Thomas

12:01 Begin ~~Sample~~ drilling SG-80
Background Sample

12:05 FEB-4 collection

~~12:10 Begin Drilling~~

12:16 Begin Purge SG-80-10
0" VAC .8 ppm @ 1:30 .2 ppm Amb
33° 26.524 N
112° 03.832 W
0.7 ppm

12:25 Sampled SG-80-10 0.6 ppm
12:26 Sampled SG-80-10-8260D
12:28 Sampled SG-80-10-TO15D

12:57 Changed tubing to 17'
Began drilling SG-81

Auger refusal @ 12.5
2' of cobbles

thurs

Todd E Thomas UPRR Phoenix 6/17/04

13:12 Begin purging SG-81-12.5
0" VAC 0.7 ppm @ 1:20 0.2 amb
33° 26.520N
112° 03.621W
0.2 ppm @ 7:00

13:22 Sampled SG-81-12.5
0.4 ppm

14:56 Begin drilling SG-82
46' S of SG-65

15:06 Begin purge SG-82-9
0.6 Amb
436 ppm @ 1:00 1st 60
63.8 ppm @ 2:00 2nd 60
51.4 ppm @ 3:30 3rd 60
59.5 ppm @ 4:20 4th 60

15:11 Sampled SG-82-9
33° 26.577N 112° 03.094W
15:18 Sampled SG-82-9-TO15D
Flow controller fitting knurled knob
at all the way down

thurs

6/17/04 UPAR Phoenix Todd E Reeves

15:36 Began drilling SG-83
40' west of SG-82
33° 26.577N 112° 03.101W

15:47 Begin purge SG-83
40.8 ppm @ 1:00 1st 60 0.6 ppm
68.1 ppm @ 1:42 2nd 60
60.7 ppm @ 2:45 3rd 60
60.9 ppm @ 3:40 4th 60

15:51 Sampled SG-83-10

16:09 Began drilling SG-84
40' east of SG-82
33° 26.576N 112° 03.091W

16:25 Begin purge SG-84-10 0.3 ppm
36.4 ppm 1:00 1st 60
65.4 ppm 1:44 2nd 60
68.0 ppm 2:15 3rd 60
67.0 ppm 3:00 4th 60

16:28 Sampled SG-84-10

thurs

UPAR Phoenix 6/17/04

17:05 Take TB-15 Samples to Aero Tech

17:50 Return to site. Scott and I move around site with drilling and asphalt patch repairing drill holes in asphalt.

19:05 Leave site

≈ 3 gallons of wash water left on south side of yard office near loading dock for evaporation.

Todd E Reeves

Tues

6/28/04 UPRR Phoenix Todd S Thomas

5:15 Arrive on site
5:50 LAB ARRIVES
6:50 Drill Rig arrives
Had flat tire
6:55 Rich (Underground locator) arrives
7:30 H&S meeting
Take Rich around to areas of interest while Scott sets up
8:15 Rich finished
8:27 3rd attempt @ SG-85
hard substance @ 1'

8:36 4th attempt @ SG-85
Drilled concrete abandoned
8:53 5th attempt @ SG-85
53' S of spur
9:32 Begin purging SG-85-10
33° 26.562N 112° 03.075W 0.0 amb
15' @ :30 0.0 ppm
2nd @ 1:15 0.6 ppm
3rd @ 2:00 0.0 ppm
4th @ 2:50 0.1 ppm
9:36 Sampled SG-85-10

Tues

Todd S Thomas UPRR Phoenix 6/29/04

10:04 Begin drilling SG-86 80' W of SG-83
10:15 Begin drilling SG-86 again 2' to the east - rocks

10:27 Begin purging SG-86-10
33° 26.583N 0.0 amb
112° 03.123W
1st 60 0.0 ppm @ 1:00
2nd 60 12.1 ppm @ 2:00
3rd 60 12.1 ppm @ 3:00
4th 60 16.5 ppm @ 4:00

10:32 Sampled SG-86-10

11:03 Begin drilling SG-87
105' E of SG-84
18' South of track
19' N of Spur track

12
11:[illegible] Begin purging SG-87-9
4.6 ppm @ 1:00 1st 60 0.0 amb
33° 26.583N 1.5 ppm @ 2:00 2nd 60
112° 03.063W 0.0 ppm @ 3:15 3rd 60
0.9 ppm @ 4:00 4th 60

Tues

6/28/04 — UP&L Phoenix — Todd & Jason

11:17 Sampled SG-87-9

11:37 began drilling SG-88
59' from SG-84
55' from SG-87
6' N of Spur track

11:58 Begin purging SG-88-10

61.3 ppm @ 1:00 1st 60 0.0 amb
80.8 ppm @ 1:50 2nd 60
87.0 ppm @ 2:30 3rd 60
85.1 ppm @ 3:30 4th 60

33° 26.583N
112° 03.068W

12:01 Sampled SG-88-10

12:14 Begin drilling SG-89
82' W of SG-88
46' from SG-84
6' N of Spur track

Tues

Todd Jason — UP&L Phoenix — 6/28/04

12:31 begin purging @ SG-89-8.5
33° 26.573N 112° 03.094W
56.7 ppm @ 1:00 1st 60 0.0 amb
60.6 ppm @ 1:45 2nd 60
59.6 ppm @ 2:30 3rd 60
59.0 ppm @ 3:20 4th 60

12:34 Sampled SG-89-8.5
12:35 Sampled SG-89-8.5-8260D
12:37 Sampled SG-89-8.5-TOI5D

13:03 began Drilling SG-90-
6' N of spur 130' W of SG-89
13:12 Began Purging SG-90-10

33° 26.576N 19.7 ppm @ :50 1st 60 0.0 amb
112° 03.128W 22.8 ppm @ 1:30 2nd 60
23.6 ppm @ 2:15 3rd 60
22.1 ppm @ 3:20 4th 60

13:16 Sampled SG-90-10

13:36 began drilling SG-91
6' N of spur 135' West of SG-90

Tues

6/29/04 UPRR Phoenix Todd E Brauer

13:47 Sampled FEB-5

14:22

~~13:50~~ Began Purging SG-91-10

33°26.55'N 0.7 ppm @ :50 1st 0.0 mmhg
112°03.143W 2.4 ppm @ 1:30 2
3.6 ppm @ 2:45 3
1.8 ppm @ 3:30 4

Using Mini cam because of problems with lab

14:26 Sampled SG-91-10

Todd E Brauer

Wed

Todd E Brauer UPRR Phoenix 6/30/04

4:30 Arrive on site
5:30 Safety briefing
5:57 Begin SG-92 ~~10~~
≈ 80' S of spur track
SG-95 to SG 92 = 158'
used drill to break up top 18"

6:24 Begin purging SG-92-10

33°26.552N 3.9 ppm @ 1:00 1st 60 0.0 mmhg
112°03.099W 4.9 ppm @ 2:00 2nd 60
3.3 ppm @ 2:40 3rd 60
2.3 ppm @ 3:30 4th 60

6:29 Sampled SG-92-10

6:43 Began drilling SG-93
72' South of SPUR
35' East of SG-87
4' N of trucks
drill top 18"

~~7:08~~ 7:09 Purging SG-93-10
33° 26.570N
112° 03.058W

Wed

6/24/04 Ward & Hance Upper Phoenix

7:09	Purging	SG-93-10	0.0 amb
		0.0 ppm @ :45 1st 60	
		0.0 ppm @ 1:15 2nd 60	
		0.0 ppm @ 2:45 3rd 60	
		0.0 ppm @ 3:20 4th 60	
7:13	Sample	SG-93-10	
8:20	Begin drilling	SG-94	
	GAB is E/C track locked out		
	3' N of track		
	102' to	SG-85	
	52' to	SG-92	
8:21	Purging	SG-94	
		0.0 ppm @ :50 1st 60	0.0 amb
33° 26.548		0.6 ppm @ 1:30 2nd 60	
112° 03.082W		0.0 ppm @ 2:40 3rd 60	
		1.3 ppm @ 3:30 4th 60	
8:25	Sampled	SG-94-10	
8:26	Sampled	SG-94-10-82600	
8:28	Sampled	SG-94-10-70150	

Wed

Ward & Hance Upper Phoenix 6/25/04

8:50	begin drilling	SG-95	
8:58	Purging	SG-95-10	
		1.8 ppm @ :50 1st 60	0.0 amb
33° 26.535N		1.6 ppm @ 1:20 2nd 60	
112° 03.111W		0.3 ppm @ 2:10 3rd 60	
		1.5 ppm @ 3:05 4th 60	
9:02	Sampled	SG-95-10	
9:25	drilling	SG-96	
	11' south of track		south of Spur
	87' from SG-56		
9:33	Purging	SG-96-10	
33° 26.594N		2.7 ppm @ 1:00 1st 60	0.0 amb
112° 03.086W		39.7 ppm @ 2:00 2nd 60	
		29.4 ppm @ 2:50 3rd 60	
		14.7 ppm @ 3:50 4th 60	
9:37	Sampled	SG-96-10	

Wed

6/29/04 UPRR Phoenix Todd E Jones

10:05 Began drilling SG-97
97' W of SG-92 used hand drill
67' S of SPT
63' N of Tracks

10:17 Purging SG-97

33° 26.537N 0.0ppm @ 50 0.0 ands
112° 03.419W 6.2ppm @ 1:50
7.6ppm @ 2:50
5.1ppm @ 3:48

10:25 Sampled SG-97-10
~~Began~~

10:42 Began drilling SG-98
used hand drill 75' S of tracks
Concrete @ 6" to 18"
4" Dark stained finish
Clike asphalt

Wed

Todd E Jones UPRR Phoenix 6/29/04

~~10~~ 11:25 Begin Purge SG-98-10

33° 26.563N 2.2ppm @ 1:00 0.0 and 0
112° 03.248W 5.0ppm @ 2:00
5.8ppm @ 3:00
4.6ppm @ 3:50

11:29 Sampled SG-98-10

11:50 Begin drilling SG-97
~~Concrete~~ 15' east of guardstation
2" thick concrete
several inch of gravel

12:30 LUNCH

13:17 Begin SG-99 again
just N of pavement hit loose
rock @ 1 ft. moved
2' west hit rock @ 2'
moved 3' west
105' E of SG-25 N of SG-

13:36 Begin purging SG-99
33° 26.587N 0.0 ppm @ 45' 1st 60 0.0 ands
112° 03.200W 3.1 ppm 1:35 2nd 60
2.2 ppm @ 2:40 3rd 60
2.7 ppm 3:40 4th 60

Wed

6/29/04 VPRE Phoenix Todd E Inman

13:40 Sampled SG-99-10

14:15 Began drilling SG-100
100' west of SG-97
72' S of spur
54' N of track

14:37 Purging SG-100-10

33° 26.539 N 1.7 ppm @ 1:00 0.0 ambo
112° 03.~~38~~ 139 W 44 ppm 1:50
3.6 ppm 3:00
3.1 ppm 3:50

14:51 Sampled SG-100-10

15:25 Began drilling SG-101
133' W of SG-100
67' S of spur
30' N of track

15:48 Begin Purge SG-101-9.0
33° 26.532 N
112° 03.159 W

Wed

Todd E Inman VPRE Phoenix 6/29/04

15:49 3.5 ppm @ 1:50
1.7 ppm @ 1:30 0.0 amb
1.1 ppm @ 2:30
1.5 ppm @ 3:00

15:52 Sampled SG-101-9.0

16:08 Began SG-102
(in case SG-101 not ND)
broke solid tip, get gas for drill

16:~~35~~ 50 Redrill SG-102
52' N of track 117' from SG-101
17
16:15 Purge SG-102-7 33° 26.538 N
143' from SG-1 3.8 ppm @ 1:50 112° 03.187 W
5.1 ppm @ 1:30 0.0 amb
~~17:15 Sample~~ 3.4 ppm @ 2:30
3.4 ppm @ 3:20

17:19 Sample SG-102-7.0
mini-Sommd

Wed

6/29/09 VIRB Phoenix

17:35 Begin drilling SG-103
Pre drilled with hand auger
120' E of SG-102
5' N of track

33° 26.526 N
112° 03.212 W

17:43 Begin purging SG-103-8

3.0 ppm @ 1:00 1st 60 0.0 amb
3.5 ppm @ 1:50 2nd 60
3.0 ppm @ 3:00 3rd 60
3.1 ppm @ 3:50 4th 60

17:48 Sampled SG-103-8

Todd E Thomas

APPENDIX E
LABORATORY REPORTS AND CHROMATOGRAMS